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ABSTRACT

Educators and educational institutions are frequently called upon to address issues when behavioral changes are needed. Solid waste is no exception. These four study guides contain activities and resources intended to help instructors and students understand what solid waste is, where it comes from, why it's a problem, and what can be done about it. The "Recycling Study Guide" includes an overview of solid waste and recycling for grades 4-12, a glossary, 20 suggested activities (with sections on goals, subjects, grades, materials, and procedure), and a list of resource publications, audio-visual materials, and organizations. A K-3 supplement to the "Recycling Study Guide" includes activities, worksheets, and take-home materials for younger students. It does not repeat the background information, glossary, and resource listing found in the original guide. "Nature's Recyclers" is an activity guide (19 activities) for ages 6 to adult, intended to help teach about natural recycling, cycles in nature, and the important role people must play in recycling our natural resources. The "Fourth "R"" is a booklet of ideas designed to help classrooms and schools practice recycling, reducing, and reusing to reinforce positive behaviors for dealing with wastes. (LZ)

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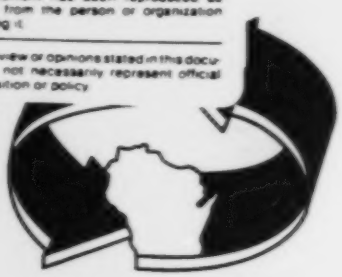

Recycling Study Guide

ED 405 180

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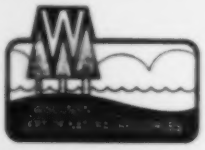

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Introduction

To Educators

Is it your turn to take out the trash? Pile your trash with all the food scraps, paper, old chairs, pop bottles and other solid waste thrown away in Wisconsin every year, and you get 9.8 million tons of stuff. Why are we making all this trash, and where does it end up?

This study guide is intended to help you and your students understand what solid waste is, where it comes from, why it's a problem and what can be done about it. The guide includes an overview of solid waste and recycling, a glossary, suggested activities and a list of resource publications, audio-visual materials and organizations.

You are encouraged to use the information and activities in this guide with your students in all disciplines. The Department of Public Instruction's **Guide to Curriculum Planning in Environmental Education** has suggestions for how to infuse subjects like solid waste and recycling into your social studies, art, english/language arts, health, mathematics, science, environmental education and other classes. You also may want to consult other resources listed in this guide and check newspapers and magazines for current articles that address the subjects of solid waste and recycling. Many excellent curriculum materials exist and we hope that you will send for and use them.

Consider talking with your students about solid waste and recycling before beginning your lessons to learn what they already know and think about it. Where is their trash taken? Have they ever visited a landfill? What did people do before there were plastic bags, aluminum cans or trash removal services? Do people in other countries make as much trash as Americans do? By finding out your students' thoughts and opinions, you can help them connect new concepts with what they already know.

The activities in this guide have been designed for use in grades 4-12. We also have the **K-3 Supplement to the Recycling Study Guide** and **The Fourth "R": An Action Booklet for Recycling in the Classroom and School**. We encourage you to tailor the activities to meet your students' needs. You are welcome to revise and/or reproduce any part of this guide for distribution to students and other educators.

Note:

- *Words that appear in italics are defined in the glossary.*
- *Sections marked with ☆ are based on materials from* **A-Way With Waste** *curriculum guide, a program of the Washington State Department of Ecology (see Resources).*

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Sizing up solid waste

People in Wisconsin throw out everything from toothpaste tubes to old TV sets, food scraps to plastic milk jugs, jelly jars to paper. If you added up all the waste from your house, from the store where you shopped and from the restaurant where you ate, it would amount to 3.1 pounds per person of municipal solid waste thrown into the trash every day. If you included all of the waste from the factories that made your clothes or paper, the utility that generated your electricity and the cannery that processed your food, it would amount to 9 pounds thrown away a day per person! Multiply that by 365 days per year, then by 4.9 million Wisconsin citizens, and your results would show that Wisconsin throws away more than 8 million tons of stuff each year!

But where is "away?" Is there such a place?

Eight million tons of trash is enough to pile a typical city street 5 feet deep, curb to curb, for 500 miles — more than the distance from Superior to Chicago! Or if compressed, the way it is in landfills, that much waste would bury a 200-acre farm under 50 feet of trash each year. So...

Where does it all end up?

Most of Wisconsin's trash ends up in the state's 100 or so licensed landfills (down from 1,000 landfills in 1988). A landfill is a place where trash is dumped, compacted and covered with dirt. Covering the trash controls blowing paper, odors, insects and rodents and keeps water out of the landfill.

Most of the licensed landfills in Wisconsin are sanitary landfills — designed, built and operated according to state-of-the-art standards to prevent pollution problems. These engineered or "approved" landfills are constructed only after the Wisconsin Department of Natural Resources (DNR) approves the site and the operating plan. The DNR checks the site for soil type, potential for contaminating groundwater and surface water, proximity to buildings and future land use. It reviews plans for landfill construction, operation, leachate and methane gas control, closure and long-term care. Approved landfills must be maintained by the owner for 20-30 years after the site is closed. The owners, however, remain liable for any damage that their landfill does to other people or property.

In addition to licensed, operating landfills, Wisconsin has over 4,000 closed landfills and old dump sites. The same long-term liability and care described above for approved and nonapproved landfills apply to these closed landfills.

Unfortunately, waste sometimes is dumped along roadsides, on the "back forty" or in other nonapproved locations. Except for household wastes discarded on the homeowner's property, it is illegal to discard or incinerate garbage, trash, industrial waste, farm chemicals and other waste in places that aren't approved by the state. Discarding waste in unsafe ways and in nonapproved places can endanger the environment upon which we depend. Thus, each of us becomes responsible for what we throw away and the impact that this waste may have on our environment.

So what's the problem?

Over the last two decades, public awareness of environmental problems has increased, stricter federal regulations regarding the siting, construction, daily operation, closure and post-closure monitoring of landfills have been developed, and the amount of municipal solid waste generated in the United States has jumped 50%. This combination of factors caused the cost to operate a landfill to increase, the number of landfills to decrease and a subsequent shortage in landfill capacity in many parts of the country.

The public believes that we are running out of space for landfills. Technically we have many sites to locate modern, sanitary landfills that will meet state and federal requirements. These new landfills are designed to be clean and to contain and collect leachate and methane gas that result from the decomposition of organic materials or the gradual breakdown of inorganic materials. However, the economics of landfill operation and the politics of landfill siting are preventing new landfills from being built. Nobody wants a landfill located near them (see sidebar on The NIMBY Phenomenon) and everyone hates to pay more for trash disposal.

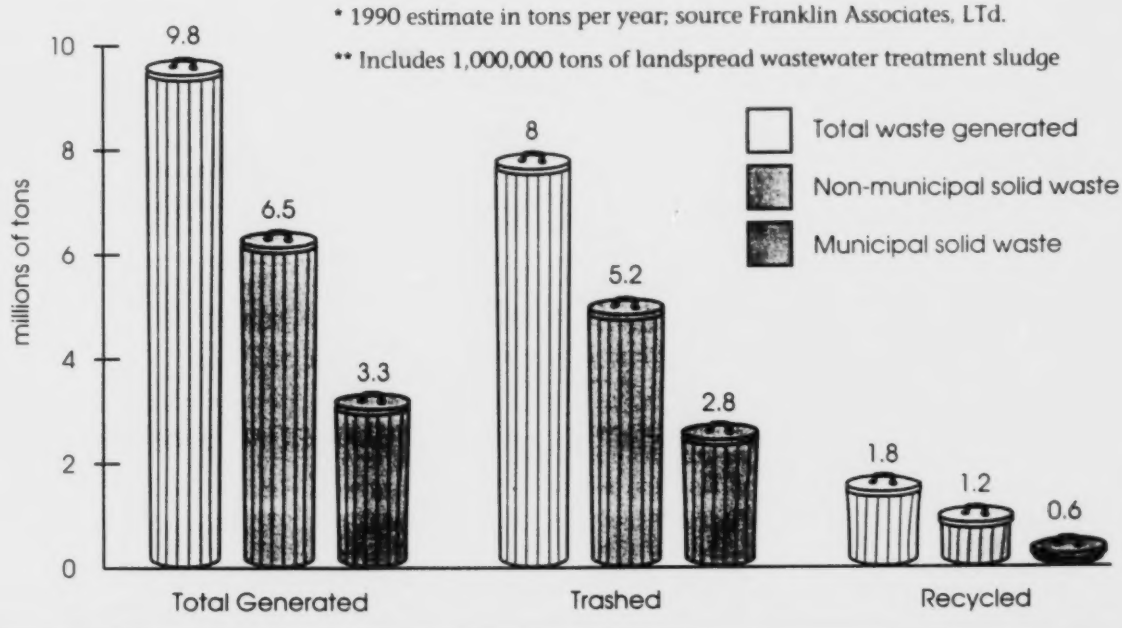
The amount of natural resources we throw away is another part of the solid waste problem that is not so apparent. Wisconsin's trash contains enough energy to heat over 300,000 homes a year and tons of metals, glass, plastic and paper that can be used over again. We need to develop ways to ecologically and economically conserve and fully utilize our natural resources.

Wisconsin's Annual Trash Tally

Category	Material Generated	Trash	Recycled
Municipal Solid Waste *			
Paper	1,380,000	1,000,000	380,000
Yard waste	491,000	436,000	55,000
Food waste	250,000	236,000	14,000
Glass containers	200,000	161,000	39,000
Plastic containers	47,900	45,500	2,400
Plastic packaging	72,000	70,400	1,600
Aluminum cans	35,000	16,000	19,000
Steel cans	50,000	38,000	12,000
Tires	47,000	35,000	12,000
Disposable diapers	49,000	49,000	-
Other waste	746,000	695,000	51,000
Total	3,367,900	2,781,900	586,000
Non-Municipal Solid Waste *			
Total	6,467,000	5,244,000**	1,223,000
Total Generated *	**9,834,900**	**8,025,900**	**1,809,000**

* 1990 estimate in tons per year; source Franklin Associates, LTd.

** Includes 1,000,000 tons of landspread wastewater treatment sludge



The NIMBY phenomenon

Finding places to put landfills is not easy. Few people are eager to live near a landfill, an attitude sometimes called the NIMBY phenomenon — "Not In My Back Yard!" Many people believe landfill construction and operation result in traffic, noise, dust, litter, aesthetic loss, declining property values, groundwater contamination and other hazardous waste pollution. While fears may have been justified in the past, modern landfill design, construction and management can minimize most of these problems. Unfortunately, the NIMBY phenomenon also applies to the siting of recycling centers and municipal composting facilities.

What else can we do with waste?

Wisconsin already reuses, recycles, composts or recovers energy from over 18% (by weight)* of its waste each year (29% if you add the 1,000,000 tons of municipal waste water sewage sludge that is landspread annually). This reduces the need for landfill space, saves the cost of disposal and reuses valuable natural resources. 1989 Wisconsin Act 335 — The Recycling Law — reaffirms the state's commitment to reduce the volume of discarded items by providing the following list of options for managing solid waste. The options are in order from most to least desirable.

* This 18% was not included as trash in the "Sizing Up Solid Waste" statistics. Wisconsinites are already recycling .6 million tons municipal (.6 lbs/person/day) and 1.2 million tons of non-municipal (1.5 lbs./person/day) solid waste each year.

1. Reduce the quantity of waste produced. For example, some products and packaging are designed to use less material, to be recyclable or to contain fewer hazardous chemicals. We can produce less waste through selective shopping. Also, we can encourage reduction by expressing our views about products and packaging to retailers, industry and government.

2. Reuse items. Soda bottles, old furniture, clothes, tires, appliances and automobiles or their parts, industrial shipping containers (barrels, pallets, cardboard boxes) and many more items can be reused.

3. Recycle. For instance, recycled newspaper can be made into newsprint, paper bags, cellulose insulation, egg cartons, animal bedding or cardboard. Glass and aluminum from beverage containers can be made into new containers. Cooking oils and meat fats can be made into chemicals and cosmetics, coal ash into shingles and concrete and plastic bottles into artificial lumber, carpeting and winter jackets.

4. Compost organic wastes. Gardeners know both the ease and the value of composting food and yard wastes to create rich humus that improves soil fertility and texture. Some businesses also can compost their organic wastes. For example, cheese whey, organic sludge from paper mills and sewage treatment plants and remains from processing or cleaning fish can be composted.

5. Incineration of waste with energy recovery. Each ton of solid waste has the energy equivalent of 70 gallons of gasoline — enough energy to drive a small car from coast to coast.

6. Landfill nonrecoverable items. We may always need landfills, but Wisconsin is working to reduce this need. Using the techniques described above, Wisconsin aims to cut the need for landfills.

7. Incineration of waste without energy recovery. Though this may be the lowest ranking option for disposal of waste, it is sometimes the only option for safe disposal of medical and hazardous wastes.

None of these options is the sole solution to our waste disposal problem. Each option has side effects that must be considered when we're selecting the best solution to each solid waste problem.

What can you do?

You can start by looking at what you throw away at home. Each person's "drop in the bucket" adds up to create the trash problem. If each drop becomes smaller, the problem will be reduced.

Everyone produces some waste, but you don't have to be a "superconsumer". Think about the goods, services and activities you buy or support. In what ways do they contribute to the solid waste problem? How could you purchase and dispose of items in ways that generate less trash? What can you do to voice your opinion about solid waste issues in your community?

For example, consider:

- buying long-lasting products rather than items that have a shorter life span and end up as waste sooner.
- buying goods in returnable and recyclable containers.
- learning where you can take items to be recycled and showing your support by recycling and buying items made with recycled content.
- composting food wastes, leaves and grass clippings.
- finding the people in your town who are interested in reducing waste, promoting recycling, inventing new uses for old materials and fighting litter. Work together with these people to promote waste reduction and recycling.
- taking an active interest in how your solid waste management dollars are spent. Compare your community's hauling and disposal costs with those of neighboring towns. Investigate the quality of your local landfill and measures being taken to make it as safe and long-lasting as possible.
- learning how nature recycles materials. Is much wasted?

Wisconsin's solid waste management goal is to find the best political, economic, social and personal ways to manage our waste while keeping the environment healthy. Each of us contributes to the solid waste problem. Each of us can help solve it.

Glossary

biodegradable: the property of a substance that permits it to be broken down by microorganisms into simple, stable compounds such as carbon dioxide and water. (See "decompose".)

bottle bill: a law requiring deposits on beverage containers, like aluminum cans and plastic bottles. May discourage littering and landfilling. More accurately called a beverage container deposit law.

composting: a waste management process that creates an optimal environment for decomposition by layering organic wastes like food scraps and grass clippings so they'll decay into fertile humus.

conserve: to protect from loss or depletion. Conservation is the wise use of natural resources to minimize loss and waste.

decompose: to break down into component parts or basic elements; to rot. Decomposition is an organic process necessary for the continuation of life since it makes essential nutrients available for use by plants and animals.

dump: open unsanitary disposal site used before existence of licensed, controlled burial sanitary landfills. Now illegal in Wisconsin.

energy recovery: the generation of energy by burning solid waste.

garbage: spoiled or waste food that is thrown away. Generally defined as wet food waste and excludes dry material (trash). The term is often used interchangeably with the word "trash".

groundwater: water beneath the earth's surface that fills the spaces and flows between soil particles and rock. Supplies wells and springs. Two out of every three Wisconsin citizens drink groundwater.

hazardous waste: waste that can cause special problems for living organisms or the environment because it is poisonous, explosive, burns or dissolves flesh or metal, ignites easily with or without a flame or carries disease. Some hazardous wastes have one characteristic, others have several.

humus: organic material consisting of decayed vegetable matter that provides nutrients for plants and increases the ability of the soil to retain water.

landfill: a site for the controlled burial of solid waste.

leachate: liquid that has percolated through solid waste and/or been generated by solid waste decomposition and contains extracted, dissolved or suspended materials. May contaminate ground or surface water.

litter: waste materials discarded in an inappropriate place. Littering is illegal in Wisconsin.

methane: a colorless, odorless, flammable, potentially dangerous gaseous hydrocarbon (CH_4) present in natural gas and formed by the decomposition of organic matter. Can be used as a fuel.

natural resource: valuable, naturally occurring material such as soil, wood, air, water, oil or minerals.

nonrenewable resource: a natural material that, because of its scarcity, the great length of time required for its formation or its rapid depletion, is considered finite in amount (e.g., coal, copper, petroleum).

organic: derived from living organisms.

pollution: harmful substances deposited in the environment, leading to a state of dirtiness, impurity or unhealthiness.

raw material: unprocessed natural resource or product used in manufacturing.

recover energy: see "energy recovery."

recycle: the collection and reprocessing of manufactured materials for remanufacture either in the same form or as part of a different product.

reduce: to lessen in extent, amount, number or other quantity.

renewable resource: a natural resource derived from an endless or cyclical source (e.g., sun, wind, water, fish, trees, cotton). With proper management and wise use, replacement of these resources by natural or human-assisted systems can equal or exceed their consumption.

reuse: to extend the life of an item by using it again, repairing it, modifying it or creating new uses for it.

sanitary landfill: a specially engineered site for disposing of solid waste on land. Constructed in a way that reduces hazards to health and safety.

solid waste: all solid, semi-solid, liquid and gaseous wastes, including trash, garbage, yard waste, ashes, industrial waste, swill, demolition and construction waste and household discards such as appliances, furniture and equipment.

solid waste management: the controlling, handling and disposal of all solid waste. One goal of solid waste management is to reduce waste to a minimum.

source reduction: a reduction in the amount and/or toxicity of waste entering the waste stream — also called waste prevention.

trash: material considered worthless, unnecessary or offensive that is usually thrown away. Trash is generally defined as dry material and excludes food waste (garbage) and ashes. However, the term is often used interchangeably with the word "garbage".

Activities

Out of Sight, Out of Mind

Note: Read the definitions for solid waste, trash and garbage in the **Glossary**. For these activities, initially consider recyclables as part of the trash. Once items are identified and recycled, they will no longer be trash. See Going Beyond in Part 1.

Part 1 — My Ton of Trash

Goal: To help students visualize how much solid waste is generated for each person in Wisconsin and understand how the number of people living in our state and country affects this amount.

Subjects: Mathematics, social studies, science, environmental education, health.

Grades: 6-12

Materials:

- 11 pound bag of miscellaneous trash and recyclables. Wash containers, avoid items with sharp edges.
- gloves

Procedure:

1. Describe trash and list some examples. Discuss:
   - What qualities does an item have that makes you decide it is trash?
   - What different kinds of trash are there?

2. Dump the 11 pound bag of trash (and recyclables) on the floor. Discuss:
   - Does this seem like a lot of trash? This much trash is thrown out each day for every person in Wisconsin.
   - How do you think the number "11 pounds" was calculated? Will the number ever change? Why?
   - How do you feel about the fact that you are responsible for 11 pounds of trash that is thrown out each day?

3. Calculate:
   - If you generate 11 pounds of trash each day, how many pounds do you make every week, month and year?
   - Convert the annual number from pounds into tons. How many tons of trash do you make each year?
   - To help you visualize how much a ton weighs, add the weights of students in the class until you reach one ton. How many students does it take to make a ton? How many "students-worth" of trash do you make each year?
   - How many people are in your family? If 11 pounds of trash are generated each day for every person, how many pounds or tons of trash does your family make every week, month and year?

• How many people live in Wisconsin? If 11 pounds of trash are generated each day for every person, how many pounds or tons of trash are generated each day in Wisconsin?
Discuss:
• What happens to all the trash you throw away?
• Where is "away"? Is there such a place?
• What do you think happens to waste at the landfill? (See activity: Where Has All the Garbage Gone?)
• What are possible problems with piling waste in landfills?
• What would you do with your family's trash if there was no truck that came to take it away? How might this affect the amount of trash your family makes?

4. Research the rate of human population growth in Wisconsin and the U.S. since 1650. Discuss:
• What relationship might there be between an increasing human population and the amount of trash generated?
• How might the amount of trash generated be influenced by changes in lifestyles since 1650? (See activity: How Times Have Changed.)
• How might the amount of trash generated be influenced by family income?
• How have increases in numbers of people and amounts of trash affected the environment?
• What are the predictions for future human population growth?
• What predictions might you make for the amounts of trash we'll produce in the future?
• What impacts might an increasing population have on our use of natural resources?

5. Calculate:
• If every person in Wisconsin threw away one less pound of trash per day, how much less trash would end up in our state's landfills?
Discuss:
• What could you do to *reduce* the amount of waste you make?

Pre- and Post-Activity Questions:
• How many pounds of trash do you think are thrown out each day for every person in Wisconsin?
• What relationship, if any, is there between the number of people and the amount of trash?

Going Beyond:
The 11 pounds of solid waste represent the amount you generate at home each day (3.7 lbs.) and your share of the amount generated by manufacturers and industry (7.3 lbs.) when they make products for you. Since 1990, the people of Wisconsin have been recycling more to reduce the amount of trash going to landfills. Each person recycles .6 pounds of household solid waste a day, and manufacturers and industry recycle 1.4 pounds a day for you (for a total of 2 lbs./person/day). Do some of the calculations above using 9 pounds for trash and 2 pounds for recyclables. What impact has recycling had on landfill space?

Part 2 — Class Trash

Goal: To have students calculate the amount and types of trash thrown out by their class at school and investigate where it is taken.

Subjects: Mathematics, social studies, science, environmental education, health.

Grades: 7-12

Materials:
- trash generated by your class on a typical day (save for use with Part 3)

Note to teacher:
Students will need to be familiar with the concepts of weight, volume and number in order to do the following activity and understand their implications. Consider using this activity as part of a mathematics lesson that addresses these concepts.

Procedure:
1. List the items you throw in the classroom and lunchroom wastebaskets on a typical day. Now categorize them according to what material they're made of (e.g., food, paper, plastic, aluminum, glass). Predict what four types of materials make up the greatest portion of the waste by: weight, volume and number of items. Record your predictions.

2. Collect and save the trash your class generates (in the classroom, art room, shop, lunchroom, etc.) on a typical day (wash jars and cans, place food trash in a sealed container). You can save trash for more than one day if you wish. This will enable you to calculate the average amount generated by your class each day.

3. Dump the trash on the floor. Sort items into piles according to the type of material of which the items are made.

4. Count the number of different items of each type (e.g., 47 pieces of paper, 3 aluminum soda cans, 8 juice boxes, 11 plastic bags, 1 broken pencil). What types of items comprise most of the trash by number? Draw a bar graph to illustrate this. Place the trash by type in separate bags.

5. Select the four types of items you estimate make up most of the trash by weight. Use one of the following methods to determine the exact or approximate weight of each type:

a) If you have a grocery scale in your classroom, weigh the items.

b) If you have a bathroom scale:

example

- Stand on the scale.
  What is your weight? ..... 100 lbs.
- Pick up a bag.
  Now what is your weight? ..... 102 lbs.
- How much does the bag weigh? ..... 2 lbs.

c. If you don't have a scale, find objects in the classroom that are of a known weight. Compare the weights of your object and the trash (use a balance if you have one). Estimate the weight of the trash.

6. Calculate the volume of the trash in each bag by measuring the width, length and depth of items in it. How might volume differ if the glass, cans or boxes are crushed? Does weight change if volume changes?

7. How do your calculations compare with the predictions you made in step 1?

8. How much trash does your class throw out in a day, week, month and school year by weight, volume and number? Calculate the average amount each student throws out in one day.

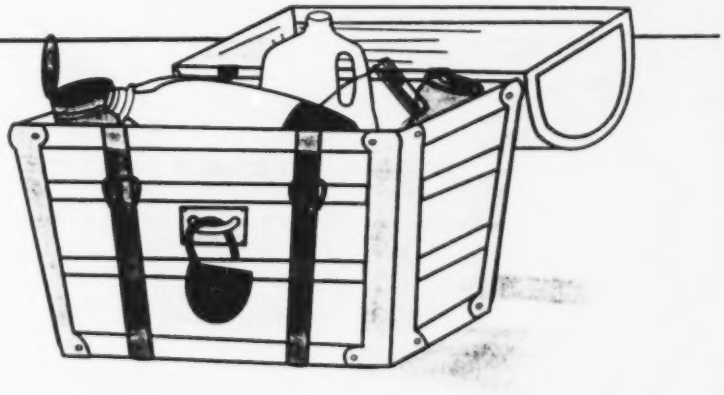
9. How much space will one school year's-worth of your class's garbage fill if the garbage is not compressed? Calculate the volume of your classroom. If you didn't remove any of your class's trash from the classroom, how much of the room would be filled with trash by the end of the year? How much room would be left for you?

10. If the number of students in your class is average for your school, calculate how much trash your school generates each school year. Discuss:
- Do you think your class makes a lot of trash? Not so much? Explain reasons for your response.
- When the trash from each class in the school is added together, do you end up with a lot of trash? Explain reasons for your response.

11. Investigate where your school's trash is taken. (See activity: Where Has All the Garbage Gone?)

Pre- and Post-Activity Questions:
- How much trash do you think your class throws away each day?
- What types of trash do you think your class throws away on a typical day?
- What happens to your school's trash?

Part 3 — Trash or Treasure?



Goal: To have students find out why, how and where they should recycle or reuse what they typically throw away.

Subjects: Science, social studies, language arts, environmental education, consumer education, family living, marketing.

Grades: 4-12

Procedure:
1. Is there anything else you can do with what you throw away? List your ideas. Most of them will fit into one of the following five categories: reduce, reuse, recycle, compost, recover energy. Write these five categories on the board. What trash items might fit best into each category? List them under the proper category heading.

2. Do a) and/or b), then answer the discussion questions:
a) To the teacher: Give each student a copy of the following checklist to fill out, or put the list on the board and work through it as a group. For younger students, you may want to use pictures of the items listed below. Feel free to add your own items.

Directions:

Put an X next to items you threw in the wastebasket this week.

___Paper bag

___Napkin

___Newspaper

___Book

___Magazine

___Paper milk carton

___Other paper

___Gum wrapper

___Aluminum can

___Apple core

___Orange peel

___Grass clippings

___Old clothes

___Plastic bag

___Plastic milk carton

___Broken toy

___Tin can

___Glass jar

___Other

Now circle all the items you think could have been reduced (used less of), reused or recycled.

Discuss:
- What items did you circle?
- How could you have reduced items?
- How could you have reused items?
- Did you wonder whether the napkin was paper or cloth? What difference might it make?
- What could you have done with the recyclable items?
- What could you have done with apple cores and potato peels?
- Which items are difficult to reduce, reuse or recycle? Why?
- Why do we make products that aren't reusable or recyclable?
- Did any of your classmates reduce, reuse or recycle any of the items you circled?
- How did they reduce, reuse or recycle the items?
- Was reducing, reusing or recycling them easy to do? Why or why not?
- What do you think happens to the items you didn't circle?

b) Sort the items that your class threw out in one day (Part 2) into the following categories: reusable, recyclable and other. Discuss:
- Why did you place each item in the category you chose?
- Does your class recycle any of the items?
- Should your class recycle them? Why?
- Are there some items your class could recycle but doesn't? Why doesn't your class recycle them?
- Are there places in school aside from the classroom where you discard trash during the day? Think about how much food and how many food wrappers, cans and bottles you discard at lunch, how many paper towels you use to dry your hands, etc.
- What happens to the items that aren't reusable or recyclable?

3. Investigate where in your community you can take items to be reused or recycled.
- How can you find out about local recycling programs? (Contact: local natural resources and environmental protection agencies, glass manufacturers, recycling businesses, municipal public works departments, used furniture and clothing stores and environmental organizations.)
- Make a list with the following information about the businesses or organizations that recycle: name, address, telephone number, materials recycled, hours of operation, whether the organization will pay you for materials and any other useful information. This information is available in: **Wisconsin Markets Directory** (see Resources).

4. Investigate and discuss:
- What are some advantages of recycling? (Conserves natural resources, saves energy, protects the environment, can make money, creates jobs for people involved in recycling and reduces our dependence on imported materials.)
- What are some disadvantages of recycling? (May cost money, takes time, takes space for storage, takes away jobs from people who make products from nonrecycled materials and depends on recycling markets.) (See activity: The Cost of the Toss.)
- What are the pros and cons of energy recovery and landfilling?

5. Brainstorm the steps your class might take to design and implement a recycling project for your classroom or school. (See activity: Time for Action.) Select a project that is feasible. For example, collect and recycle paper from the school's copy machine and classrooms. Who can you contact to help you with your project?

6. Consider doing your project!

Pre- and Post-Activity Questions:
- What is recycling? What are reuse, energy recovery and landfilling?
- What types of solid waste can be recycled, reused, recovered or landfilled?
- What can you do in your school to recycle solid waste?

Part 4 — Cutting Class Trash

Goal: To have students realize that reuse and recycling of materials are not the only or main solutions to the solid waste problem. A key step is to cut down on the use of materials that become solid waste.

Subjects: Consumer education, family living, social studies, science, environmental education.

Grades: 5-12

Procedure:

1. In what ways can you reduce the amount of trash you throw out at school? Don't forget to consider waste from the art room, shop, lunchroom, etc. Write your ideas on the blackboard and request that it not be erased for one week.

2. For one week, cut down on your use of paper, food packaging and other materials. Refer to the suggestions on the blackboard. Note: It isn't fair to "cut down" by throwing things out in other trash cans in the school.

3. At the end of each day, calculate the amount of trash and list what individual items make up most of the trash. (See Part 2 for instructions.)

4. Compare your findings with the amounts calculated in Part 2. Calculate:
- Did you throw out less trash when you tried to cut down? How much less?
- If your class cut down on use of materials for the school year, how much less trash (in pounds) would you send to the landfill?

Discuss:
- How easy is it to cut down on how much you use?
- Do you feel that it is worth doing? Why?
- Will you continue to cut down on your use of materials, or is this class activity a one-shot deal?

Pre- and Post-Activity Questions:
- How can you reduce the amount of trash you generate in your class/school each day?

Going Beyond:

1. Take a copy of the checklist and questions from Part 3 home and fill it out. Note to teacher: Include a cover letter to parents explaining that the class is studying solid waste and recycling, and you would like them to help their children see what kind of solid waste is generated at home. Discuss:
- What did you find out about what your family throws away?
- How do you feel about your findings?
- What ideas do you have for what you could do with the trash generated at home?

2. Trace the "afterlife" of one of the items on the checklist from Part 3. For example, what happens to the plastic bag or paper milk carton after it's taken to the landfill? Does it decompose? Does its decomposition create harmful by-products? What impacts might its decomposition have on air, soil, water and health?

3. Create a reusable item from something you're going to throw away.

4. Investigate what types of used materials organizations like the Salvation Army and Goodwill Industries need and what they do with the materials they receive. Look for stores in your community that sell used products (appliances, furniture, sports equipment, etc.) Look for businesses in your community that repair items.

5. Discuss the role of yard sales or garage sales in recycling and reusing materials.

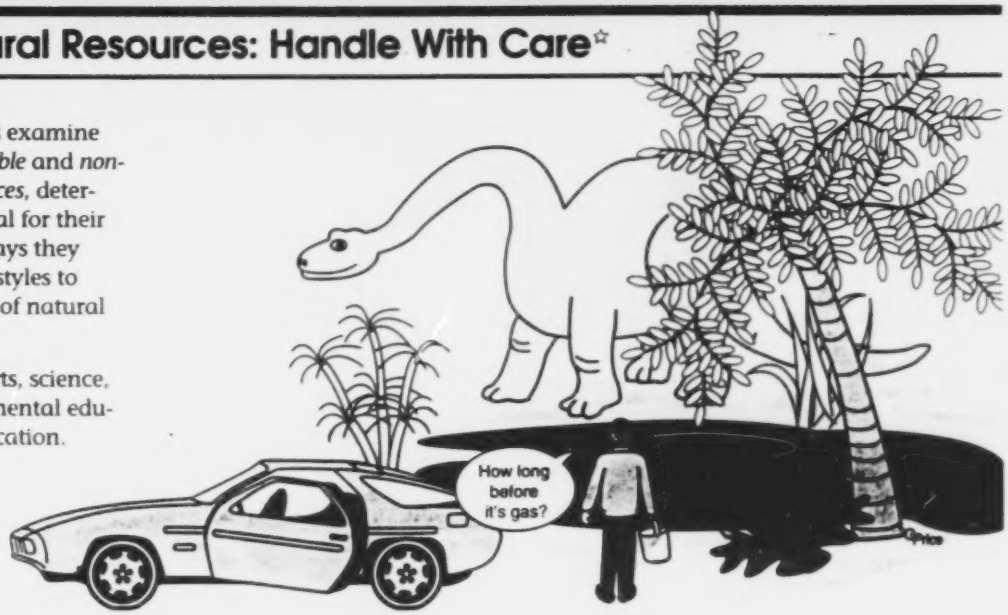
6. Investigate how the amounts and types of wastes generated by a bank, office building, grocery store, clothing store and hospital differ. How does each business dispose of its waste? Do any recycle materials?

7. Our changing lifestyles over the last 20 years have affected what and how much we throw away. What lifestyle changes have affected our disposal habits?

8. Research and report on waste disposal habits of other countries. How do they deal with solid waste? Do they make as much garbage as Americans do? Why or why not? How do you feel about this?

Right in My Hometown

Part 1 — Natural Resources: Handle With Care*



Goal: To have students examine their own use of *renewable* and *nonrenewable natural resources*, determine which are essential for their survival and suggest ways they might change their lifestyles to make more careful use of natural resources.

Subjects: Language arts, science, social studies, environmental education, technology education.

Grades: 6-12.

Procedure:

1. What is a natural resource? List several examples.

2. Define the terms "renewable" and "nonrenewable" resource. Some renewable resources are: solar energy, water, food and wood. Some nonrenewable resources are: petroleum, tin, bauxite, coal, copper and lead.

3. Do a, b or c below:

a) List the products you used or consumed during a specific time period, e.g., between the time you got home from school yesterday and the time you went to bed; between the time you got up this morning and the time you left for school.
b) Describe a scenario or event, and as a group, list what products were used.
c) Have the teacher select and read a story in which people use a variety of products. As a class, list what products were used. Discuss:
- Which products are made of renewable resources, nonrenewable resources?

4. Classify each product as: essential to survival, necessary for maintaining my present lifestyle, a luxury. Discuss:
- What criteria did you use to define what is essential, is necessary for maintaining your present lifestyle or is a luxury?
- Which, if any, items listed in the "essential" category are really not essential for survival? Explain your response.
- Do you think your parents or grandparents would place the products in different categories? How would their list differ from yours?

5. After discussing the lists, suggest alternatives for each item, making an effort to replace items you think are inefficient or wasteful with items that are less wasteful. Discuss:
- Would using alternatives increase or decrease your use of renewable resources?
- Would using alternatives increase or decrease your use of nonrenewable resources?
- How might changes in the production and consumption of these products influence the economy and the environment?
- Why do we use nonrenewable resources to make products?

6. Look at the list of luxury items. Which items could you give up without a major change in your lifestyle?

7. Make a list, beginning with the easiest item to give up and ending with the most difficult. Could you give up the top three items on this list for a day? a week? a month? Try it. How do you feel?

8. Think of several ways to reuse or recycle items you decide you can't give up.

9. Identify some of the economic, cultural and environmental impacts of any changes you make or recommend. Consider the implications if your entire family, school, community and country made such changes.

Pre- and Post-Activity Questions:
- Define and give examples of: natural resource, renewable resource, nonrenewable resource.
- List four items you use that aren't essential for your survival. What impact does their production or disposal have on our environment, economy, culture?
- Would you be willing to give them up or use alternatives if you discovered that the impact is significantly adverse?

Part 2 — Biography of a Product

Goal: To have students investigate the natural resources required to make a product that is manufactured in their community, determine whether the resources are renewable or nonrenewable and consider the impacts that production has on the environment and economy (locally and elsewhere).

Subjects: Social studies, science, health, language arts, environmental education.

Grades: 6-12

Procedure:

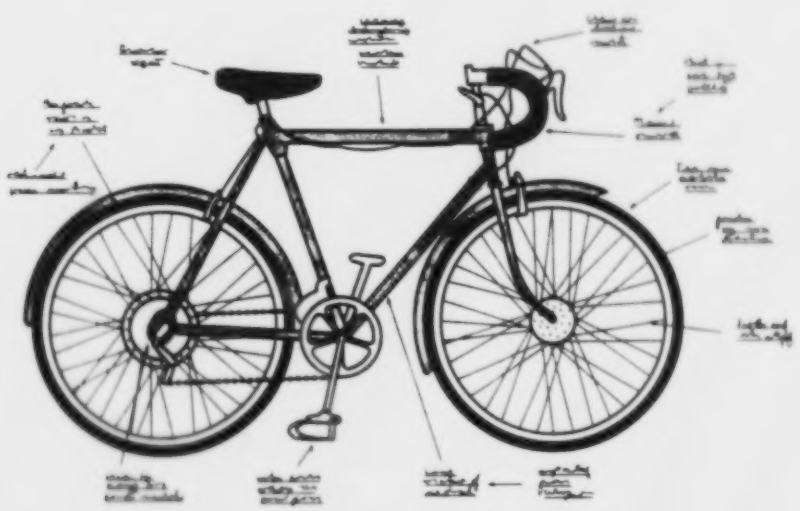
1. Select one product that is made in your community. For example, bicycles are made in Waterloo, batteries and bologna in Madison, pens in Janesville, soy sauce in Walworth, shoes in LaCrosse, ships in Sturgeon Bay, beer in Milwaukee, glass in Burlington and cheese, paper and plastics in many towns.

2. List or draw on the blackboard the production steps and all the *raw materials* required to make the product. Contact or visit the manufacturer if you need more information about the process and materials used to make the product.
Discuss:
- Are more raw materials required to make your product than you expected?
- Where did the raw materials come from? Is the source in your town, state or country?
- What amounts of these raw materials are available?
- What happens to the environment when the raw materials are extracted from the earth or harvested? Does this process produce pollutants or destroy land or ecosystems? How might it affect people living in the area?
- Were the raw materials changed (refined) before they got to your town?
- Were there any by-products made from refining the raw materials?
- What happened to these by-products?
- What impacts does each step in the manufacturing process have on the environment? the economy?

3. Categorize the product as: essential to survival, necessary for maintaining my present lifestyle or a luxury. Discuss:
- What criteria did you use to make your decision?
- What impacts does use of the product have on the environment?

4. Describe what happens to the product after you use it. Discuss:
- Can it be used up or will it wear out?
- What will you do with it?
- Can the product or its parts be reused or recycled in some way? How?
- Will the product or its parts decompose if buried in a landfill?
- What effects does disposing of this product have on the environment?
- Can it be safely burned to produce energy? Does burning it release harmful chemicals?
- Who pays for disposing of the product?
- Who is responsible for disposing of it?

Going Beyond:
Investigate answers to the following questions by checking books, articles and magazines, or writing to agencies or organizations for information.
- What natural resources used by the U.S. come from other countries? How much of each resource is imported? found in the U.S.?
- How does importing raw materials influence: U.S. and world economics, politics and security; the local and global environment; social systems and jobs in the U.S. and other countries?
- What used, recyclable materials (e.g., newspaper, scrap metal) does the U.S. export to other countries? Why does the U.S. export these materials? Why do the other countries import these materials?
- How long will known reserves of coal, wood, oil, iron, copper, petroleum, water, bauxite, natural gas and zinc last if we continue to use them at present rates? Are any of them renewable resources? What might happen as we begin to use up these resources? (Investigate: offshore oil development; mineral exploration in Antarctica and world political implications; the coal economy of Kentucky and West Virginia; U.S. oil interests in the Middle East; timber controversy in the Pacific northwest.)



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Where Has All The Garbage Gone?

Part 1 — Making a Mini-Landfill☆

Goal: To have students examine the materials that comprise the products they use, describe whether these materials are renewable or nonrenewable resources, observe what happens to materials when placed in an old fashion dump and a newer sanitary landfill and decide whether they should be disposed of in a different way.

Subjects: Science, social studies, environmental education.

Grades: 4-6.

Materials:
- eight large clear glass jars
- four tight-fitting lids for jars
- dry soil
- miscellaneous solid waste
- crayons
- masking tape

Procedure:

A) 1. Choose one item you threw away today. What is your item made of? Into which of the following four categories of solid waste does your item fit?
a) organic (e.g., potato peels)
b) renewable resource/recyclable (e.g., newspaper)
c) nonrenewable resource/recyclable (e.g., aluminum cans)
d) nonrenewable resource/hard to recycle (e.g., tooth brush)

2. What happens to the item you threw away? Discuss:
- Where is away?
- What is a dump?
- What is a landfill?
- What is the difference between a dump and a landfill?

3. List ways you can avoid disposing of your item in a landfill.

B) 1. With crayons and masking tape, label two sets of glass jars with the four category headings above. Label one set of jars "Set 1"; the other "Set 2".

2. Fill each jar in "Set 1" and "Set 2" about half full with soil.

3. Sort each solid waste item into its proper category (a-d). Put a small sample of each into the "Set 1" and "Set 2" jars with the corresponding labels and cover with soil. Do the following:
- "Set 1", leave the lids off and keep soil damp with water.
- "Set 2", put the lids on tight; do not add water.
- Place both sets of jars on a shelf away from people and out of direct sun.

4. Predict what you think will happen to the solid waste in each jar. Record your predictions.

5. Observe and record what changes occur during a 4-6 week period, if any. Discuss:
- What happened to the items made of organic and renewable resources in "Set 1"? "Set 2"?
- What happened to the items made of nonrenewable resources in "Set 1"? "Set 2"?
- How did what happened compare with your predictions?
- What comparisons can you make between "Set 1" and "Set 2".

6. "Set 1" represents the old fashioned dump; "Set 2" represents the newer sanitary landfill. What comparisons can you make between your mini-dumps and mini-landfills and a real dump and a real landfill?

C) 1. Keep a record of your family's purchases from two trips to the grocery store. Divide the items into the four solid waste categories listed above. Discuss:
- What does your family do with the waste from its store purchases?
- Is there anything your family could do with the waste from its store purchases besides landfilling?
- Could you substitute items from "d" with items from "a-c"? Is this a worthy goal? Why?
- If your goal is to reduce solid waste, what else could you do with items from "d" to keep them out of landfills?

Pre- and Post-Activity Questions:
- Define and give examples of: organic material, renewable resource, nonrenewable resource.
- What do you think will happen to items made of renewable or nonrenewable resources when they're put in modern landfill?
- List four items you use everyday that you could recycle.

Part 2 — Follow That Garbage!

Goal: To have students see where their garbage goes and investigate their community's solid waste disposal issues.

Subjects: Social studies, science, health, environmental education.

Grades: 4-12

Procedure:
1. a) Contact your municipal landfill and obtain permission for your class to visit it. Arrange for the site manager, owner or other resource person to guide your trip and be available to answer questions. A list of local waste disposal sites can be obtained by contacting your DNR district solid waste management specialist. Be sure to follow all safety precautions while visiting the site.

b) If you are unable to take a field trip, ask a guest speaker to come and discuss local solid waste management with your class. Resource people you might contact are: waste disposal site operators, private waste haulers, Extension agents, environmental health officers, government officials, environmental organization representatives, DNR and local solid waste managers and public works personnel.

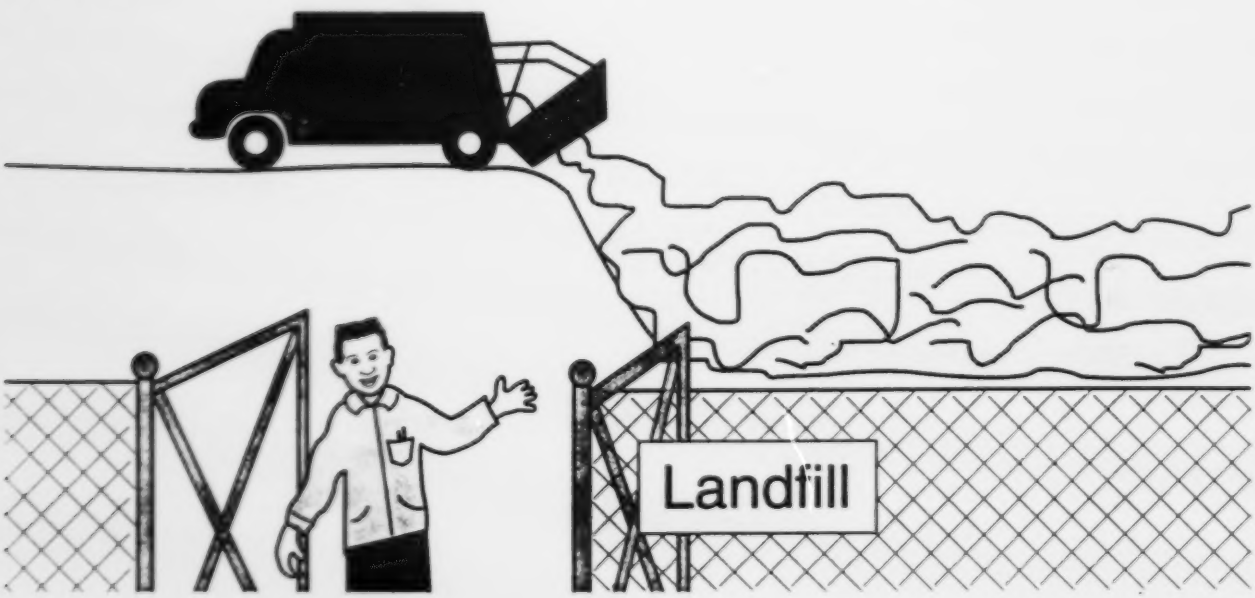
2. Before visiting the municipal landfill or having a guest speaker, develop a list of questions you would like answered. Investigate possible answers to your questions. Then send the questions to the guide or guest speaker in advance so he/she can prepare responses. Questions to consider include:
- Where is the trash from your school or home taken?
- How does it get there?
- Why was the landfill located on this site? What factors must be considered when a site is selected? What tests were done at the site before it was opened? What were the results?
- What laws govern solid waste disposal in your community?

- Is the landfill an engineered or unengineered site?
- Who owns the landfill? When did it open? What was the cost of constructing it?
- Who does the site serve? Who can bring wastes to the landfill?
- What is the fee for using the landfill?
- How much does your family pay for trash collection?
- How much does it cost to take care of trash once it's in the landfill?
- How much solid waste is disposed of at this site daily, weekly and yearly?
- Who works at the site? Do they monitor what is dumped?
- What happens to the trash once it is dumped in the landfill?
- Are any of the materials hazardous? Are there regulations or procedures for dealing with hazardous wastes?
- What is the land adjacent to the landfill used for? Is the landfill a problem for nearby landowners? If so, in what ways? What has been done to alleviate the problems?
- How is the site managed for control of blowing trash, odors, noise, animals, erosion, surface runoff, leachate and methane gas?
- Are tests performed regularly at the site (groundwater, soil, methane gas)? What are the results?
- Is there a resource recovery program at the site? If so, what is recovered? How?
- What impacts does resource recovery have on the economy and environment?
- How many years is the landfill expected to last? How much time does community have to find a new site?
- How will the landfill be monitored and cared for after it is closed? Who is responsible? Who pays for this? What will be done with the land at the site?
- What alternatives for waste disposal is your community practicing or considering for the future?
- How have or will these alternatives impact the amount of trash going to the landfill?
- How can you participate in making the decisions that develop future waste management plans in your community?

3. Now that you know more about landfills:
- How do you feel about them? Will we always need them?
- Are they the best way to dispose of trash? What are possible alternatives?
- What can you do to help reduce solid waste?

Pre- and Post-Activity Questions:
- Where is the trash you throw away taken?
- What eventually happens to your trash there?
- What is the difference between a *dump* and a *sanitary landfill*?

Going Beyond: For older students...
- If your community has a solid waste incinerator, visit it. What are the pros and cons of incineration?
- Investigate waste disposal techniques, problems and laws in other parts of Wisconsin, other states in the U.S. and the world. Consult individuals, books, newspapers, magazines and state agencies.
- Conduct a hearing to decide where to locate a landfill in your community. Take the roles of the people involved with the decision: local landowners, politicians, industry representatives, environmentalists, waste managers and others.
- Landfills often have been developed in wetlands, although this is now illegal in Wisconsin. Consider the following questions:
- Why were landfills often located in wetlands?
- What problems might exist with placing landfills in wetlands?
- Are wetlands an important ecosystem? Why?



Composting: A Great, Rotten Idea

Background: When we mention "recycling," we often think of recycling glass bottles, aluminum cans and newspapers. Another 22% of the household garbage we throw out can also be recycled. These recyclables are food scraps, leaves, grass clippings and other *biodegradable* organic wastes. Organic wastes can be recycled by *composting*. Simply stated, composting involves creating conditions to promote decomposition. Decomposition is the biochemical process by which bacteria, fungi and other microscopic organisms break organic "wastes" into nutrients that can be used by plants and animals. Decomposition occurs in nature whenever a leaf falls to the ground or an animal dies. It is essential for the continuation of life on earth. The result of decomposition in a compost pile is a nutrient-rich mulch that is excellent for improving soil quality and plant growth.

Part 1 — Is It Rotten?

Goal: To have students investigate the pros and cons of composting.

Subjects: Science, health, environmental education, vocational agriculture, consumer education, family living.

Grades: 4-12

Materials:
- rotting log, grass clippings, leaves or food scraps

Procedure:

1. Define: recyclable, biodegradable. List materials that are recyclable and/or biodegradable.
- Are there recyclable materials that aren't biodegradable? Are there biodegradable materials that aren't recyclable?

2. Feel, smell and look at the rotting log, grass clippings, leaves or food scraps. What words would you use to describe these materials? List these words. Do the words have positive and/or negative connotations? Why?

3. Explain what is happening to the rotting material. Discuss:
- What is the natural process that breaks biodegradable material into particles that can be used again by plants and animals? (decomposition)
- What organisms assist in this decomposition process? (fungi, bacteria, earthworms, springtails, mites, etc.)
- What will your rotting material finally become? (humus)

4. Imagine a world where decomposition doesn't take place. Discuss:

• What would happen to organic materials like dead animals, leaves or sewage?
• Could plants and animals survive if decomposition did not occur? Why or why not?
• Is decomposition important? Why?

5. Now think of words to describe rot or decomposition. List them. Do the words have positive and/or negative connotations? Why?

6. List items you throw away that are biodegradable. Discuss:
• How might you and your family recycle these materials?
• What is composting?
• Why do you think people compost household organic wastes?

7. What are some benefits of composting household food and yard wastes? For example:
• Doesn't require the purchase of plastic bags often used for disposing of household and yard wastes.
• Saves the cost of transporting wastes to and handling wastes at the landfill. Wisconsin discards 3/4 million tons of compostable municipal yard waste and food scraps every year. It costs $80-93 per ton to collect wastes in urban areas and $25-$32 per ton to dispose of them. How much money do Wisconsin citizens spend each year disposing of their compostable wastes?
• Saves space in the landfill. Landfills are filling up fast. At the end of 1990, Wisconsin had 38 million tons of municipal landfill capacity left and was filling up landfills at the rate of 4.6 million tons per year. Within 8 years, most will be filled to capacity. Thus, Wisconsin already has a serious problem — where will we put all our waste?
• Reduces pollution from landfills.
• Creates nutrient-rich mulch you can use to fertilize and improve the texture of your yard and garden soil; saves money you might spend on mulch or fertilizer.

8. What are some possible problems with composting? Are they really problems? Here are some potential problems and answers:
• It's too much work. Once you have established your composting site, composting takes very little time and effort. If you make it into a routine, composting is easy. If you want to do less work, leave your grass clippings on the lawn and plant low-maintenance lawn covers. Follow the guidelines in **Yard Care: Do Your Share** (see Resources).
• You'd have to run outside every time you eat an apple or peel a potato. Just place scraps into a plastic container with a lid. Keep the container in or under the kitchen sink, then take the waste to the compost pile whenever the container is full.
• Yard wastes and food scraps can be thrown away because they are not harmful to the environment. Landfilled yard wastes and food scraps take up space and may release harmful methane gas. Food scraps put down the garbage disposal end up in the sewage system, where treating them can tax the system and cost money. If you can afford a garbage disposal, perhaps you can afford a "no work" composter. Easy-to-use, compact and attractive composting bins are available commercially. Contact your garden center or the DNR Bureau of Solid and Hazardous Waste Management for details.
• It might smell and attract rats. If you maintain your compost pile according to basic guidelines in publications like **Home Composting: Reap a Heap of Benefits** and **Home Composting: The Complete Composter** (see Resources), your pile should not smell or attract rats.
• The neighbors might not like it. If you locate, build and maintain your pile properly, it should not be offensive. Take the opportunity to explain what you are doing to your neighbors and why you feel composting is important.

Part 2 — Readin', Rottin' and 'Rithmetic: Classroom Composting

Goal: To have students learn about recycling in nature and actually recycle organic matter by composting.

Subjects: Science, health, environmental education, consumer education, family living, vocational agriculture.

Grades: 4-12.

Materials:

- fish aquarium
- organic waste materials (be sure to add a variety of materials, not all one kind, i.e., use sawdust, hair, wood ash and leaves in addition to food scraps; avoid meat scraps, fats and oils, which inhibit decomposition and in outdoor compost piles can attract dogs, rats, raccoons and other animals)
- lawn fertilizer that contains nitrogen (but not herbicides or insecticides) or manure and green grass clippings that also contain large amounts of nitrogen. Be careful, don't use too much nitrogen, a carbon: nitrogen ratio of 25-30:1 is ideal. (Grass clippings already have a carbon:nitrogen ratio of 19:1 while leaves have a 60:1 ratio.)
- soil
- 1-2 dozen red earthworms (obtain from yard, garden, school grounds, or local bait shop)
- thermometer
- trowel or large kitchen spoon (for turning, or aerating, the pile)

Note: Air circulation is important to decomposition, thus the best compost bin is one with wire or screen sides. Mass also is important, since approximately one cubic yard of compost is needed to generate good decomposition temperatures (104-170 F). Thus, an aquarium, with its small size and glass sides, is not the best compost container. Consider constructing an outdoor compost pile with wire sides on the school grounds. For instructions on outdoor composting, contact: DNR Bureau of Solid and Hazardous Waste Management.

Procedure:

1. What "ingredients" do you think are needed to construct a compost pile? Why? List ingredients. For example:

- **soil:** contains microorganisms that help decomposition.
- **organic wastes:** such as leaves, food scraps, grass clippings. Wastes should be varied, including materials with both carbon and nitrogen. By alternating layers of high-carbon and high-nitrogen materials, you can create good environmental conditions for decomposition to occur.
- **nitrogen:** many of the organisms responsible for decomposition need nitrogen, thus nitrogen is necessary for rapid and thorough decomposition. Nitrogen is found naturally in organic wastes (higher in "green" materials like grass clippings than in "brown" materials like dry leaves), and in many commercial fertilizers.
- **worms:** they eat the waste, helping to break it down; make droppings, which enrich the soil; tunnel through and aerate the waste, facilitating decomposition; and eventually die and become part of the compost.
- **water:** necessary for normal functioning of life. Too much water in a compost pile may make it soggy and slow decomposition by reducing needed oxygen.
- **air:** the biological activity of fungi, bacteria, small insects and other organisms results in decomposition. Most biological processes require adequate amounts of oxygen.

- **time:** decomposition takes time. To speed up decomposition, aerate (by turning it over) your pile every few days; otherwise, just leave it and wait.
- **heat:** heat is produced by chemical reactions resulting from increased biological activity that occurs during decomposition. Heat helps sanitize compost by killing certain organisms (e.g., weed seeds, pathogens, harmful insect larvae).
- **mass:** in order to generate enough heat for optimal decomposition, the pile must contain at least one cubic meter of organic material. Thus, the temperatures generated in an aquarium compost pile may be different from those generated in one that is larger.

2. Design a plan for making a mini-compost pile in the classroom. Decide which ingredients students

will provide and which will be supplied by the teacher. Set a date for constructing your pile.

3. Suggestions for creating a mini-compost pile:
a) Chop the organic wastes into small pieces. You can leave some large pieces of the same materials to compare rates of decomposition between large and small items. Why might there be a difference?
b) Alternate layers of the materials as follows (amounts are approximate): inch of soil, two inches of organic waste, sprinkle of fertilizer, sprinkle of water, repeat.
c) Cover with an inch of soil. Water the pile enough to make it moist but not soggy. It should feel like a damp sponge (it feels moist, but you can't squeeze water out of it).
d) Add the earthworms and observe their behavior.
e) Place your compost pile where it will be at room temperature (not in direct sun).

4. Place the thermometer in the middle of the pile. Wait an hour or so, then record the temperature.

5. Record the temperature from the same location and depth, and at the same time each day. Why is it a good idea to be consistent with location, depth and time of recording? Does the temperature change? Why or why not? Make a graph to show your temperature results.

6. Gently mix the compost once a week to aerate it. A good time to turn the compost is after the temperature peaks and begins to drop. Why? Be sure to record the temperature before you turn the compost that day.

7. Be patient. Occasionally check the moisture and add water if needed.

8. Make a chart to help you keep a daily record of temperature and other observations during the next month or two. Observe:
- Which materials break down the fastest? Slowest? Why?
- Are there any odors? Why do you think decomposition has an odor?
- Does the texture of the compost change? In what ways?

9. Once the materials in your compost pile have decomposed into humus, conduct the same feel, smell and look test that you did in Part 1, #2.

10. Now decide what your class should do with this rich soil. When you clean out the aquarium, should you dump the humus in the trash; take it outside and dig it into the soil; or use it for growing plants in the classroom?

11. Discuss:
- How does composting reduce the amount of waste you would have thrown out?
- What do you think happens to organic wastes that end up in the landfill?
- Is the landfill a gigantic natural compost pile, or are there problems with placing large amounts of organic material in landfills? (no air, limited moisture, etc.)

12. Now that you have constructed and maintained a mini-compost pile in the classroom, how would you go about constructing and maintaining one at home?

Pre- and Post-Activity Questions:
- What is composting?
- What are the necessary "ingredients" for a good compost pile?
- How is composting related to the concept of recycling?
- How can composting reduce waste?

Going Beyond:
- Create a compost pile as in Part 2, but also add manufactured items like a soda can, paper clip, bottle cap, aluminum foil, iron nail, pencil, crayon, paper, plastic bag, rubber band, etc. Predict rates of decomposition or lack of decomposition and observe actual changes, if any.
- Take a field trip to a local woods or park. Examine a rotting log or leaf litter. Place a sample of rotting humus in a white enamel pan and sort through it carefully, looking closely for "decomposers." What decomposers (insects, mites, fungi, etc.) can you find? What do you think they are doing? Read about their life histories. (Do activity: A Rottin' Place to Live in: **Trees are Terrific**. See Resources.)
- Make a Berlese funnel to help you capture tiny soil animals. Examine them using a magnifying glass or binocular microscope. Make drawings of them and try to figure out what kind of animal they are. Read about their life histories. (See: **Soil Animals** and **The Living Earth** in Resources.)
- Make a worm composter. (see **Worms Eat My Garbage** in Resources.)
- Visit someone who maintains a compost pile. Why do they compost? What do they do with the compost? Have they had any problems? Would they recommend composting?
- Investigate what happens to the leaves your community discards each autumn. What do you think should be done with them?
- If your community has a municipal composting center, take a field trip to it. Be sure to prepare questions to ask the guide.
- Have students design experimental compost piles. For example, make a pile that: is low in nitrogen; lacks moisture; has little air circulation; or is made of a single ingredient (e.g., just grass clippings). Also create a good compost pile for comparison. Compare rates and temperatures of decomposition between piles.
- Fill flower pots with different soil types, including one type that has your humus mixed in. Plant seeds or grow seedlings in the pots. Make 4-5 pots with each soil type so that you're comparing more than one plant grown in each type (i.e., so that you have a large enough sample size to make a valid judgement). Do the plants in different soil types grow at different rates, with different vigor, color, etc? What are possible explanations for any differences?

Is It A Waste?

Background: Why do we buy one product instead of another? Often it's because of the packaging. Packaging accounts for over 30% of all consumer wastes. While packaging is designed to protect merchandise, it also is designed to sell products. Excess and non-recyclable packaging add to our energy and waste problems. The packaging industry has been responding to the solid waste problem. One of their solutions is "light-weighting" or reducing the amount of material used to make a package. Consumers can help too.

Part 1 — All Wrapped Up☆

Goal: To have students investigate the purpose of packaging and identify ways to reduce the amount of packaging they throw away.

Subjects: Family living, consumer education, social studies, language arts, health, science, environmental education.

Grades: 4-12

Procedure:

1. Bring in an example of food packaging. Discuss:
- Why is the product packaged? (To protect the product, hold product during shipping, prevent spoilage, protect health, prevent theft, provide convenience, make the product look more appealing, etc.)
- Is the packaging essential? wasteful? Why or why not? What criteria are you using to make your decision?
- What influence do you think packaging has on the salability of the product?
- Does the packaging benefit your lifestyle?
- How does the packaging affect the quality of the product?

2. Design a way to categorize the packaging. For example, sort it according to "natural" packaging (bananas, apples, peanuts); "older" packaging (paper bags, returnable glass bottles); and "modern" packaging (plastic wrap, polystyrene, plastic milk bottles). Discuss:
- What happens to the packaging once the product is used?
- Which packaging is/isn't recyclable?
- Which packaging is/isn't made from recycled materials? renewable resources?
- What are the environmental pros and cons of making and disposing of each type of packaging?
- Which packaging would you label "most wasteful?" "least wasteful?" Why?
- If this packaging didn't exist, how would your lifestyle be affected?

3. Brainstorm ways that you could reduce the amount of packaging you purchase. For example, could you purchase products in bulk? How would this help reduce packaging? (A 3 ounce tube of toothpaste requires 50% more packaging per ounce than a 7 ounce tube.) What problems could develop as a result of your choice? (Some food bought in bulk might spoil before you eat all of it.)

Pre- and Post-Activity Questions:
- List three examples each of recyclable and non-recyclable packaging.
- What criteria might you consider when deciding whether packaging is necessary? wasteful?
- What happens to most of the packaging you purchase? What can you do to change this?

Part 2 — What's the Appeal?☆

Goal: To have students quantify the number of times television and radio ads try to sell products for reasons not related to product quality and list some of the techniques advertisers use to promote products.

Subjects: Social studies, language arts, consumer education, family living, environmental education.

Grades: 7-12

Procedure:

1. Find samples of different advertisements for the same type of product (soda, athletic shoes, detergent, potato chips). Select ads for different name-brands and types of packaging. Discuss:
- Which product would you buy? Why?
- What is advertising? What is the purpose of advertising?
- Does advertising influence what you buy? How?
- Which advertisement do you like best? Why?
- Do your reasons have anything to do with the quality or function of the product?
- Do you purchase name-brand items instead of generic items? Why?

2. Discuss ways in which products are promoted on television, radio and in print. Analyze at least 25 ads. Note the following:
- What strategy does the advertiser use to sell the product?
- What is the advertisement really selling: convenience? health? sex appeal? status? fun? quality?
- Does the advertisement mention the packaging?
- Is the packaging reusable or recyclable?
- Does the ad suggest what you should do with the packaging?

3. Design a chart to help analyze characteristics of these ads. A sample follows (feel free to add other categories):

4. Make a composite chart that shows the results of all the surveys done by students. Discuss:
- Which marketing strategies are used most often to promote packaged products?
- What strategies were used that were not listed on the sample form?
- What usually happens to the packaging?
- Who should be responsible for what happens to the packaging once the product is used: manufacturer? government? citizens? consumers?

Pre- and Post-Activity Questions:
- Name three reasons you buy one type of packaged product instead of another.
- How often are your reasons based on the quality or function of the product?
- Discuss ways in which advertisements may influence what you choose to purchase.

Name of Product	Television	Radio	Print (magazines, newspapers)	Other	Status	New and Improved	Convenience	Sex Appeal	Symbols	Self-Image	Famous People	Flashy Packaging	Band Wagon	Vague Pronouns	Keeping up with the Joneses	Other

Part 3 — How Many Ways Can You Wrap An Apple?

Goal: To have students design packaging and advertising strategies to sell a product, analyze why they decided on their strategies and consider why they buy one product instead of another.

Subjects: Social studies, language arts, art, drama, environmental education.

Grades: 6-12.

Materials: An apple or other object (hammer, child's toy, batteries) for each student or group of students. Each student or group should have the same item.

Procedure:
1. You have just gotten a job as an advertising agent for an apple company (you can work either individually or with a group of other students). Your first assignment is to develop an ad campaign and packaging design to sell apples. Keep track of the reasons you chose your particular design and sales pitch. Your campaign can consist of skits, poems, songs, posters or whatever you believe will sell the product.

2. Present your ad campaign to the class.

3. Display the "products" (numbered in some way). Vote for the apple you would buy (each class member should vote anonymously on slips of scrap paper). Tally the results. Discuss:
- Why did you choose the product you did?
- How much packaging was involved in the "winning apple?" Was the packaging necessary? Why or why not?
- What influence does the packaging have on the quality of the product?
- Why was the product packaged?
- Who should pay for your packaging?
- Who should pay for disposal of your packaging?
- Were you concerned about disposal of your packaging?
- If you are primarily interested in selling the product, is it more important to package the item to sell than to package it to have low environmental impact? Are these two concepts mutually exclusive? Could you design a package that sells but doesn't use a lot of energy or resources to produce or dispose of?
- Do you have any choices about how much packaging you purchase?

Pre- and Post-Activity Questions:
- Who do you think makes decisions about what packaging to use for a product?
- What factors are consider when deciding how to make a product sell?
- Why do you think people will buy products that have a lot of packaging?
- What can you do to reduce the amount of packaging you throw away?

Part 4 — Packaging, Is It A Waste?☆

Background: A lot of energy and natural resources are consumed to produce the packaging that is used to promote, store and deliver our food, and approximately 7% of our municipal solid waste stream is food packaging. Is food packaging a waste? Or, does food packaging help reduce another large portion of our waste stream — food waste (7-10%).

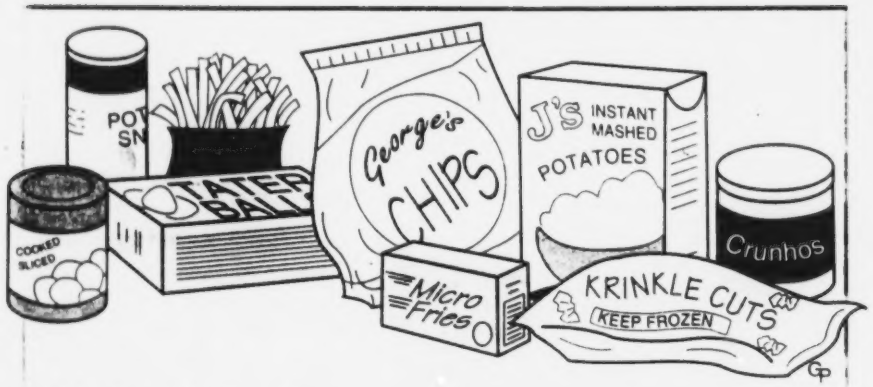
Goal: To have students consider problems associated with energy and resources expended in food packaging and the complexity of promoting, delivering and storing food in our society.

Subjects: Consumer education, family living, agriculture, social studies, language arts, mathematics, environmental education.

Grades: 7-12

Procedure:
1. Examine the following chart. Discuss:
- Which forms of the potato are most highly processed and packaged?
- Which are most expensive per pound?
- How long can you safely store the different forms of potatoes?
- Which form of potato would you purchase if you were interested in: reducing solid waste at home? saving money? convenience?

2. Consider the following quote from Dr. William Rathje, a modern-day landfill archeologist: "In terms of garbage generation, the lowly potato peel is a powerhouse among [foods]: of all food that is thrown away..., potato peels account for a mighty 7% by weight — the largest single item in fresh food repertoire." Discuss:
- Which forms of potato produce the most waste (packaging and peelings) at home?
- Which forms of potato produce the most waste at the processing plants?
- What do food processors do with their vegetable wastes? (spread in fields, compost, sell for animal feed, etc.). Are these really wastes?



This Spud's For You

Product*	Package Size	Price	Price per Pound
Fresh Idaho Potatoes	10 lb.	$1.79	$ .18
Fresh Idaho Potatoes	5 lb.	1.19	.24
Fresh Idaho Potatoes	loose/lb.	.49	.49
Sure Fine Canned Sliced Potatoes	16 oz.	.49	.49
Orelda Tater Tots	4 lb.	3.49	.87
Orelda Tater Tots	2 lb.	1.89	.94
Roundy's Crinkle Cut French Fries	5 lb.	3.59	.72
Roundy's Crinkle Cut French Fries	2 lb.	1.79	.90
Orelda Microwave French Fries	12 oz.	1.15	1.53
MicroMagic Microwave French Fries (three 3-oz. pkgs.)	9 oz.	.99	1.76
Small Order McDonald's French Fries	2.4 oz.	.83	5.53
Betty Crocker Potato Buds	28 oz.	2.79	1.59
Betty Crocker Potato Buds	13.75 oz.	1.69	1.97
Durkee Potato Sticks	7 oz.	1.59	3.63
Durkee Potato Sticks (eight 1/4-oz. pkgs.)	6 oz.	2.18	5.81
Pringle's Potato Chips (reg.)	7 oz.	1.29	2.95
Jay's Potato Chips (twin pack)	8 oz.	1.43	2.86
Jay's Potato Chips (twelve 1/2-oz. pkgs.)	6 oz.	1.97	5.25

* All items priced on April 12, 1993, at Woodman's Grocery Store and McDonald's in Madison, WI.

- What functions do the various forms of packaging serve?
- How can you reduce the amount of packaging and not throw away potato peelings?

3. Working with a partner, select a fresh food item to investigate, such as a tomato or corn. If possible, go as a class to the grocery store (or go independently after school). Calculate and/or record the price per pound of the fresh product as well as 5-10 items that are processed from that product. Make a chart like the potato one for the product you are investigating. Discuss:
- Which form of food item is the most expensive per pound? Why?
- What relationships are there between cost and the amount of processing and packaging?
- Which form of food item would you purchase if you were interested in: reducing solid waste at home? saving money? convenience?

4. Contact a food processing company. Find out what percentages of their costs are due to purchasing, processing, packaging, and shipping of the product. Ask them how they dispose of their production wastes.

5. Which of these products will you buy in the future? What criteria will you use for making your decisions about what to buy and what not to buy?

Pre- and Post-Activity Questions:
- What percentage of the cost of packaged foods is due to processing and packaging?
- Which of your favorite foods could you buy with no packaging? Which ones would you have to do without?
- How can packaging of foods be reduced while still addressing health and safety concerns?

Part 5 — What Can I Do To Change Packaging?

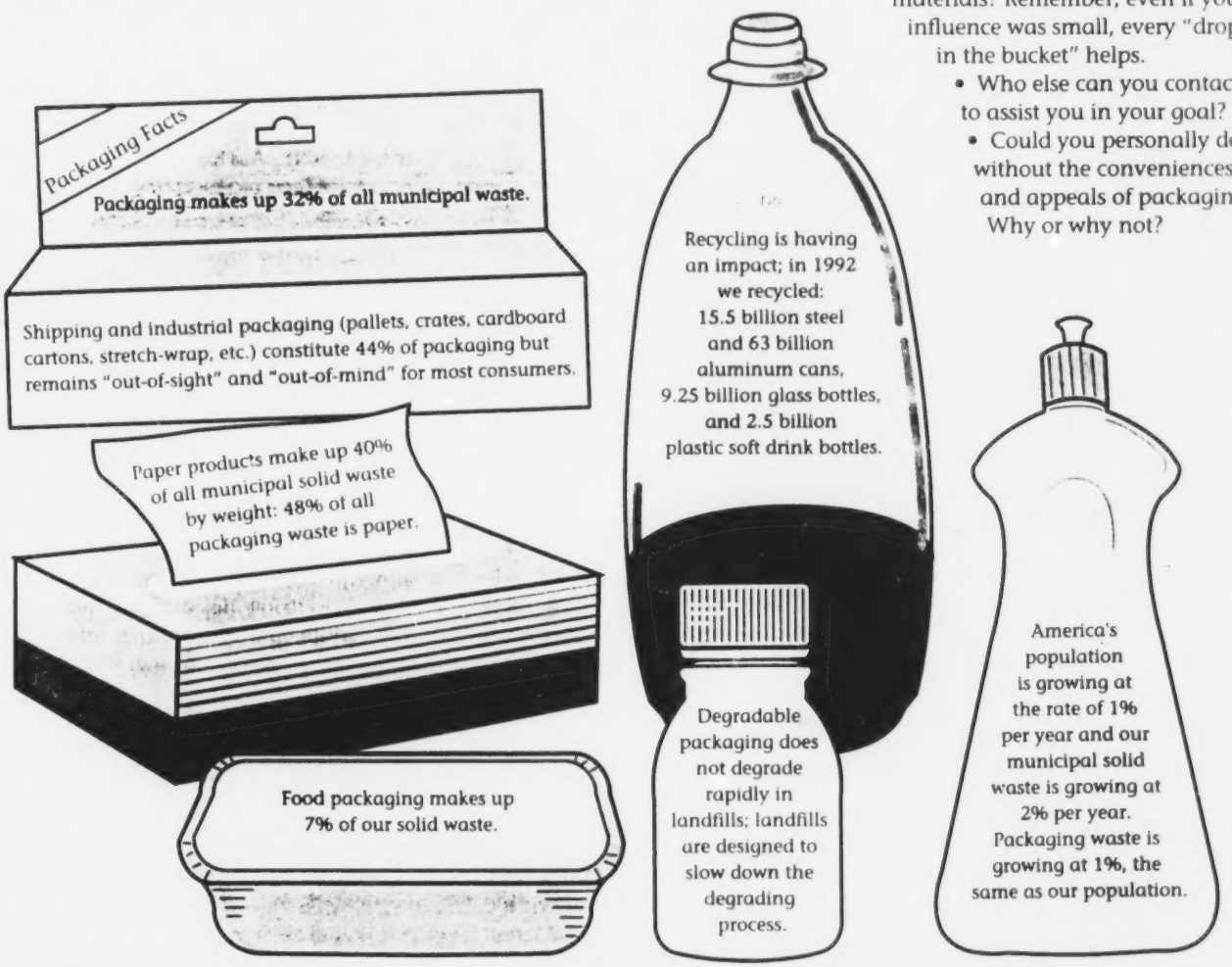
Goal: To have students identify steps that can be taken to affect the packaging options available in the marketplace and encourage them to act on an option (See activity: Time for Action).

Subjects: Language arts, social studies, environmental education.

Grades: 5-12

Procedure:

1. Brainstorm what you can do to encourage change in packaging procedures. List your ideas. For example:
   - Write letters encouraging retailers to carry beverage containers that can be returned or recycled.
   - Write to the manufacturer of a product that seems over-packaged and express your concern. Ask them to consider reducing the amount of packaging and design packaging to facilitate recycling. Request a response.
   - Write to legislators urging them to support waste reduction and recycling legislation.
   - If a product's packaging has been improved (reduced packaging, made with recycled content, recyclable, etc.), write and thank the manufacturer. This will encourage manufacturers to continue these practices.
   - Refuse to purchase over-packaged items in stores and tell the manager why.
   - Bring your own cloth bag instead of accepting bags and extra wrappings from the store cashier and bagger and tell them why you are doing this.
   - Look for and purchase products that are packaged in recyclable containers and/or made from recycled material.
2. Do some of the things you suggest.
3. Evaluate your results. Discuss:
   - Did you receive a response to your letter? If not, send another copy.
   - Did the response you received address your concerns and answer your questions adequately?
   - Do you feel that your actions have had an influence on reducing unnecessary packaging or encouraging use of recyclable materials? Remember, even if your influence was small, every "drop in the bucket" helps.
   - Who else can you contact to assist you in your goal?
   - Could you personally do without the conveniences and appeals of packaging? Why or why not?


Packaging Facts
Packaging makes up 32% of all municipal waste.
Shipping and industrial packaging (pallets, crates, cardboard cartons, stretch-wrap, etc.) constitute 44% of packaging but remains "out-of-sight" and "out-of-mind" for most consumers.
Paper products make up 40% of all municipal solid waste by weight: 48% of all packaging waste is paper.
Food packaging makes up 7% of our solid waste.
Recycling is having an impact; in 1992 we recycled: 15.5 billion steel and 63 billion aluminum cans, 9.25 billion glass bottles, and 2.5 billion plastic soft drink bottles.
Degradable packaging does not degrade rapidly in landfills; landfills are designed to slow down the degrading process.
America's population is growing at the rate of 1% per year and our municipal solid waste is growing at 2% per year. Packaging waste is growing at 1%, the same as our population.

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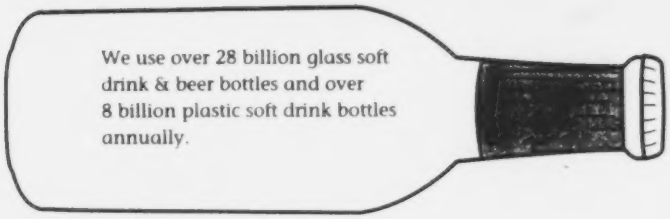


Going Beyond:

• Read the following true-life scenarios. Based on what you now know about packaging and the impact of advertising and convenience, etc., analyze and discuss what is going on in each scenario. How do you think people in these scenarios might behave differently to reduce the amount of trash they discard?

What lifestyle changes occurred over the last 30 years that affect our purchasing and disposal habits?

Scenario 1:

Mr. Jones and his young son, Sammy, are at the convenience store to buy a gallon of milk. Mr. Jones picks up the plastic jug of milk and heads for the check-out. In the meantime, Sammy has been eyeing the candy, and asks if he can have some. Mr. Jones says yes, and Sammy places his choice (individually wrapped jaw-breakers) on the counter. The clerk rings up the purchase and puts the milk jug in a paper bag. Sammy demands his own bag for his candy, and the clerk looks questioningly at Mr. Jones. Mr. Jones nods to the clerk, who gives Sammy his own bag. Once out of the store, Sammy takes his candy out of the bag and throws the bag away. Mr. Jones does the same with his bag when he gets home.

Scenario 2:

Ms. Smith has just finished mowing the lawn and asks her daughter, Kate, to help rake the grass clippings and stuff them into black plastic bags. Kate also rakes up some leaves that have blown into the shrubs. Ms. Smith and Kate haul the bags to the curb for garbage collection. Their neighbor, Carol, walks by and asks why they are putting the grass and leaves in plastic bags. Kate responds that she doesn't know any other way to get rid of them — people always dispose of them that way (she points to the house across the street, which also has thrown out grass in plastic bags). And besides, it's the way her mom has asked her to do it. Ms. Smith explains that the ads on TV said bags were good to use for throwing away garbage like grass and leaves. She bought the heavy-duty ones with the built-in tie because she had a coupon, and because the ad said they are tough and easy to use.

Scenario 3:

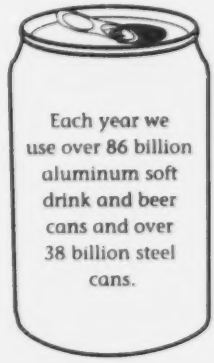
Luke and Jennifer are on their way home from school and are starving. They stop at the fast-food restaurant for a burger, fries and soda. They pay, pick up the bag with their order and go to the nearby park to eat. Luke opens the bag and takes out the sodas and paper napkins. He puts a plastic straw through the plastic spill-proof lid on his paper cup, then grabs for the cardboard container holding the fries. "You like ketchup?," he asks Jennifer, as he opens the plastic ketchup packet. Meanwhile, Jennifer is eating her burger, having stuffed the box, designed to keep the burger warm, back into the bag. She adds some pepper from the little paper packet, but decides she doesn't need the salt she got, so leaves it in the bag. When they're both finished eating, they put the garbage (from two burgers, two sodas and one french fries) in the trash can and head home.

• Purchase a large box of cereal and a variety pack that contains an equal weight of cereal. Remove (or eat!) the contents. Weigh the cardboard, foil, plastic and/or wax paper packaging. Which item (large box or variety pack) has more packaging per unit of cereal? Which costs more per unit of cereal? Why do you think it costs more? If you want more cereal for your money, which would you buy? If you want less packaging for the same amount of cereal, which would you buy? Why is cereal packaged in variety packs? Can any of the packaging be recycled?

• Talk with an older person in your community about what grocery shopping was like 50 years ago. Were the stores the same size or arranged inside like they are today (e.g., did shoppers take their own groceries from the shelf, or did the clerk do it for them)? Where did the term "supermarket" come from? Why have there been changes in the way food is marketed? Were there as many items to choose from then? Why? How were the items wrapped?

• Write down what you had for lunch and list all the containers and packaging that came with the food. Discuss the items that could be reused or recycled.

• Interview grocery shoppers to find out why they buy certain products. What do they do with the packaging? How often do they consider packaging when they make a purchase?



How Times Have Changed

Part 1 — What, No Video Games?

Goal: To have students investigate and think about how technologies, lifestyles and values change through time and how these changes alter the production and handling of wastes. To encourage students to develop a greater understanding of history and to express themselves through language.

Subjects: Social studies, language arts, science, art, environmental education.

Grades: 5-12

Materials:
- tape recorder (optional)

Procedure:
1. Imagine yourself as a reporter investigating how times have changed since your parents and grandparents were children. To help you begin thinking about how things have changed, read either Section 1 or 2, or investigate the past by consulting books, the local historical society, old magazines, antique stores, museums, etc. As you do this, think about how you'd answer the questions that follow each Section. Discuss your answers in class.

2. Interview your parents, grandparents or other adults to find out what they used in their everyday lives for toys, clothing, food wrappings, trash cans, etc. Ask how these items have changed through time and how they feel about these changes. You can either design your own interview or read Section 1 or 2 to the person(s) you are interviewing, then ask the accompanying questions. (If you have a tape recorder, tape the conversation. Be sure to ask the person(s) being interviewed if they mind being taped.)

3. Discuss your interview results in class.

Section 1: Sayings and Slogans

You've all heard sayings like:

"A stitch in time saves nine." "Waste not, want not."
"Built to last a lifetime." "Haste makes waste."
"An ounce of prevention is worth a pound of cure."

More recently, we hear slogans like:

"Quick and easy to use." "No mess, no bother." "Disposable."
"Individually wrapped for your convenience."
"They sure don't make 'em like they used to."

Questions:
- What other similar sayings and slogans can you think of?
- What are these slogans saying about our lifestyles and how they've changed?
- Which messages point out product quality? Which emphasize product convenience?
- Are products today built to be durable, convenient to use or both? Why? What do you think about this?
- What qualities in products did people appreciate when you were growing up? Has that changed over time? How?
- Did people take better care of their belongings when you were growing up than they do now? Why? How many pants, dresses and pairs of shoes did you have? What were the clothes made of? When clothes tore or wore thin, were they repaired or were new ones purchased? What did you do with old clothes?
- Can you show me a family heirloom and describe the qualities that make it so special?
- Why are we attracted to items that are "new and improved?"
- Are we more wasteful today? In what ways? Why?
- What types of things did you throw out in the trash? Were they similar to what we throw out today? If you heated with wood or coal, what did you do with the ashes? What containers did you use for trash? What did you do with trash? Did you have as much trash to throw away then as you do now?

Section 2: Toys for Us

Toys have changed through the years. At one time, most were made from natural objects. Then they were made of papier-mache, or were handmade country toys like whirli-gigs, bean shooters, yo-yos, limber jacks and tops. Over time, commercially manufactured toys became available, like wooden Lincoln Logs and Tinker Toys and metal Erector Sets. Then plastic toys came on the market — toy guns, frisbees, hula hoops and plastic models. Now, battery-operated and electronic toys, pinball games, video games and computers are popular.

Questions:
- What were your favorite toys when you were little? How many toys did you have?
- What were your toys made of? Who made them?
- How long did your toys last? Could they be fixed if they broke? Would it have been cheaper to fix the toy or get a new one? Why? Could you fix a broken toy at home or did someone else have to fix it?
- If broken toys could not be repaired, what did you do with them?
- How are toys sold today different from those you had?

Part 2 — The Garbage Guzzler Strikes Again

Goal: To have students investigate and think about how technologies, lifestyles and values change through time and how these changes alter the production and handling of wastes. To encourage students to develop a greater understanding of history and to express themselves through language.

Subjects: Social studies, language arts, science, art, environmental education.

Grades: 4-7

Procedure:

1. Read the unfinished story "The Garbage Guzzler Strikes Again."

2. Write a final paragraph that describes what the Garbage Guzzler dumped in Jody's backyard. Read and discuss your concluding paragraphs in class.

3. Discuss possible answers to the questions that follow the story. Did your endings answer some of these questions?

4. For an art assignment, draw your image of the Garbage Guzzler.

Questions:

- From what dates in history did the Garbage Guzzler collect garbage?
- What items might Sam and Jody find in each garbage pile?
- What are these items made of?
- How many of the items do you think would be recyclable?
- Compare the items in the different piles. What do the differences indicate about the lifestyles of people at each location and each period in history? What might people from each period in history think about the garbage from other periods?
- What will happen to the items if they stay in Jody's backyard for a year? ten years? fifty years?
- What predictions do you have for what we will be throwing away in ten years? fifty years?

The Garbage Guzzler Strikes Again

Sam and Jody's teacher has given their class an assignment to write about recycling and how the stuff Americans throw away has changed throughout history. Sam and Jody are having a tough time with the paper. Lucky for them, the Garbage Guzzler suddenly appears and offers to lend a hand!

The Guzz picks up the empty trash can behind Jody's house and takes off in his Time Machine. Sam and Jody have no idea what the Guzz is up to. Are they surprised when he returns with a can of garbage he collected from a Pilgrim's house in Plymouth, Massachusetts! The Guzz makes three more trips in the Time Machine, returning with garbage collected from a Philadelphia house during the meeting of the first Continental Congress, from a miner's shack near Sutter's Mill during the California Gold Rush and from a Wisconsin house the day after Mount St. Helens erupted. He dumps all four piles of garbage in separate piles in Jody's backyard.

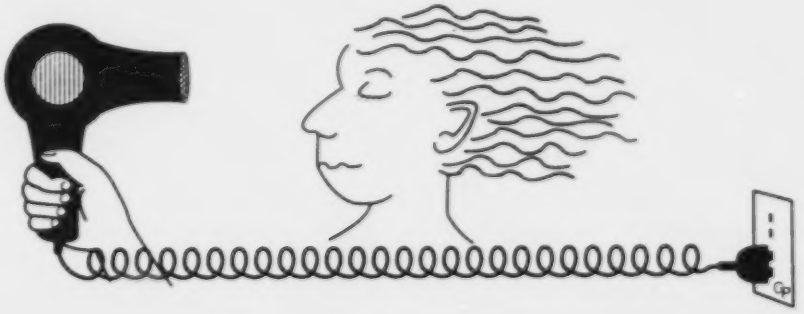
Sam and Jody are amazed by what they see in each pile. The Pilgrims had thrown out...

- What predictions do you have for the amount of trash we will throw away in ten or fifty years compared to how much we throw away now?
- Is there anything you can do to influence what trash will be like or how much trash there will be?

Going Beyond:

Consider how other products we use in our homes have changed through time. Discuss:

- What did people do before there were products like Scotch tape, hairdryers, toilet bowl cleaner, soda cans, toothpaste tubes and pumps, plastic cups, power lawn mowers, disposable diapers, plastic wrap, vacuum cleaners, plastic shampoo bottles, microwave ovens, etc.? Can you do without these today?
- What did they do with their leaves and garden clippings before there were plastic bags?
- How do changes in technology affect our living habits, our waste habits, our opportunities for recycling and our environment?



The Cost of the Toss

Part 1 — Decisions, Decisions

Goal: To have students develop a better understanding of what options exist for managing solid waste and the costs and benefits of each option.

Subjects: Social studies, mathematics, environmental education, science, health.

Grades: 6-12.

Procedure:

1. Imagine yourself as the mayor of Wonderful, Wisconsin. Yours is a pleasant city of 65,000 people. Unfortunately, Wonderful is in the midst of a not-so-wonderful crisis: your landfill must be closed because it doesn't comply with present standards for protecting the environment. What's Wonderful going to do with all its garbage?

As mayor, you're responsible for investigating new options for managing Wonderful's solid waste. You begin by forming a solid waste committee to study the options. Who do you think should sit on this committee (town treasurer, public works director, citizen representative, landfill developer, etc.)? Assign fellow classmates to play these roles and decide on a name for your committee.

2. Call a meeting of the committee. Your assistant has prepared the chart, "Managing Garbage From Homes," to help members see some options and impacts of managing garbage for Wonderful's homes. Study the chart and, as a group, consider the following questions:

- At first glance, which waste disposal option seems best? Why? Do you all agree? Is there one best option?
- What criteria and values are you using to judge options? Are you pro-business, pro-taxpayer, pro-environment, pro-convenience? Discuss how your personal points of view might influence how you judge the importance of each potential impact.
- For how many years into the future are you planning? Why is this an important consideration (population growth, long-term economic and environmental impacts, etc.)?
- How big is 52,000 cubic yards? How much space will you need if you choose to landfill Wonderful's garbage for that many years?
- Compare the pros and cons of citizen convenience and environmental impacts for each option. Do you consider citizen convenience more important than environmental impacts or vice versa? Why? How does your view affect which option you think is better?
- What is the relationship between net cost and citizen convenience? Is what's convenient the least/most expensive? If saving money is your main concern, which option would you choose? Should saving money be your only concern?
- Does this chart calculate in the "costs" of each option's long-term environmental impacts or use of natural resources? What might these "costs" be? How much should your committee be concerned about these "costs" in making your decision? How easy is it to put a dollar value on environmental damage?
- If creating jobs is high on your list of priorities, which option would you choose? What do you think about the often-made statement that recycling eliminates jobs?
- You have read somewhere about composting municipal solid waste. Where can you find out more about composting? Why might your community consider composting as a valid option for waste disposal? Which wastes could be composted?
- What are the pros and cons of incineration? Do you think the benefits (landfill space saved, energy produced, convenient) outweigh the costs (landfill still necessary, toxic ash and air pollutants produced, expensive)? What are the experiences of other communities that already have installed incinerators? How do the pros and cons of incineration compare with those of recycling?
- Recycling newsprint sounds like a great way to save landfill space and trees. But you've heard that some newspapers use ink that contains lead, a hazardous metal. What happens to this lead when the paper is landfilled? recycled? composted? burned? What have newspaper manufacturers substituted for lead inks?

3. Investigate what is required by your local, state, and federal governments for choosing the waste management option(s) for Wonderful (e.g., public hearing, citizen referendum, DNR approval, environmental impact statement).

4. Do you feel you have enough information to make a wise decision for your town? If not, where can you find this information?

5. Now that your committee has investigated and discussed the options for Wonderful's solid waste management plan, make a decision about which option(s) the town should enact.

6. List suggestions for what you can do to ensure the success of Wonderful's new waste management plan (e.g., community education, providing containers for recycling).

Managing Garbage From Homes: Options & Impacts*

Option	No. of employees	Landfill needs/yr. (cubic yards)	Net Cost ($/yr.) (includes sale of any energy produced)	Amount of Energy (gallons of gas equivalent)	Environmental Issues	Citizen Convenience
a)Landfill everything (landfill 15 mi. away)	Collection 40 Landfill 2 Total 42	52,000 yd3	Collection $1,300,000 Landfill 520,000 Total $1,820,000	Collection 30,0000 Landfill 13,000 Total Used 43,000	— is unattractive — uses land — can pollute water & air — can create hazardous gases (methane) — bury/lose natural resources	— just put waste at curb
b) Voluntary Recycling Curbside pickup of: glass, newsprint, plastic, cans. Landfill remainder	Collection 44 Recycling center 8 Landfill 2 Total 54	47,000 yd3	Collection $1,400,000 Recycling (10,000) (profit) Landfill 470,000 Total $1,860,000	Collection 33,000 Recycling (300,000) (saves) Landfill 12,000 Total Saved (255,000)	— reduces impacts at landfill — reduces pollution from manufacturing — reuses natural resources	— need to separate recyclables — builds good habits
c)Mandatory Recycling (as in "b" above)	Collection 48 Recycling center 15 Landfill 2 Total 65	42,000 yd3	Collection $1,500,000 Recycling (60,000) (profit) Landfill 420,000 Total 1,860,000	Collection 36,000 Recycling (600,000) (saves) Landfill 9,000 Total saved (555,000)	— same as voluntary recycling above — requires enforcement for non-compliance — builds good habits	— need to separate recyclables
d)Mandatory Composting of yard waste. Landfill remainder (assume yard waste is composted at home)	Collection 42 Composting 1 Landfill 2 Total 45	45,000 yd3	Collection 1,350,000 Composting 50,000 Landfill 450,000 Total $1,850,000	Collection 33,000 Composting 1,000 Landfill 10,000 Total used 44,000	— reduces need for landfill — reduces methane gas pollution — reduces strength of leachate — produces fertile humus — reuses natural resources	— need to separate yard waste — builds good habits
e)Incinerate for energy recovery. Landfill ash & non burnables (incinerator in town)	Collection 38 Incinerator 12 Landfill 1 Total 51	10,000 yd3	Collection $1,250,000 Incineration 750,000 Landfill 200,000 Total $2,200,000	Collection 28,000 Incineration (840,000) (produces) Landfill 2,000 Total (810,000) Produced	— reduces need for landfill — produces fly ash high in heavy metals that requires special handling — produces air pollutants — consumes natural resources	— just put waste at curb

*Example compares costs for a community producing 100 tons/day, 5 days/week.
Numbers presented are realistic (1986) but not specific to any one community.
Other options and combinations of options exist.

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Part 2 — Paying the True Price of Pop

Goal: To have students develop a better understanding of what options exist for managing solid waste and the costs and benefits of each option.

Subjects: Social studies, mathematics, environmental education, science, health.

Grades: 6-12.

Procedure:

1. Bring pop containers made of different materials to class to help you focus your inquiry on real objects. Discuss:
   - What materials are your containers made of?
   - How might this determine how you should dispose of them?
   - What do you think are the best ways to manage the future of your containers? Why?
   - How much of the cost of the pop do you think is packaging? How much is the cost of the pop itself?

2. Study the information in the chart "Paying the True Price of Pop". Discuss:
   - How much of the cost of the pop is packaging?
   - Is the cost of the packaging a fair price to pay for the delivery of the pop?
   - Who should be responsible for its disposal?

3. List the possible disposal options for these containers. What are the associated costs and benefits? Consider waste management impacts on economics, energy use, environment, jobs, etc. For example:
   - Who pays for the cost of disposal?
   - What impacts might the disposal of your containers have on the environment? Who pays for the long-term environmental impacts of waste disposal?
   - Does any disposal option have an impact on energy? Are there any energy savings? How much?
   - If you are concerned about reducing solid waste in your town, then which container(s) would you buy?

Paying the True Price of Pop*

	Product Size	Package Price	Price per 8 oz.
Two Liter Plastic Bottle	67.6 oz.	$1.09	$.13
Six-Pack of 20 oz. Glass Bottles	120 oz.	2.79	.19
Six-Pack 12 oz. Cans	72 oz.	1.89	.21
24-Pack 12 oz. Cans	288 oz.	5.89	.16

* All items priced on April 12, 1993, at Woodman's Grocery Store in Madison, WI.

Going Beyond:

- Investigate how your town disposes of its solid waste. How much is landfilled, recycled, composted, incinerated? What plans does your town have for handling solid waste in the future? What do you think about these plans?

- Contact your trash hauler to find out the total costs of collection, transportation and disposal per ton of solid waste. Discuss:
  a) If your family produces 2 1/2 tons of trash each year (the average for a family of four), then how much should your family pay for trash removal service? How does this compare to the cost of cable TV, the newspaper, or a six-pack of soda a week?
  b) How much does your family pay each year for trash service?
  c) Do you think the cost for the care of your solid waste is reasonable or unreasonable? Why?
  d) Would you be willing to pay more to dispose of your trash? Why or why not?
  e) How does the amount your family pays for its trash service compare with amount it pays for water or sewage service?
  f) Would you be willing to recycle some household trash items if your town made it easy (provides drop-off or curbside service)?

- Investigate how society subsidizes some methods of handling waste. What do you think about such subsidies? For example:
  a) Do your property taxes or waste disposal fees fully cover the cost of your landfill?
  b) Does the government give tax breaks for use of virgin materials? recycled materials?
  c) How many of your tax dollars are spent on educating citizens about recycling and composting?

Time For Action

Goal: To help students understand the process of taking environmental action. To have them identify a specific waste management problem in their community, design a research question addressing it, conduct the research and decide how and whether to take action to help solve the problem.

Subjects: Social studies, science, language arts, environmental education.

Grades: 7 - 12.

Procedure:

1. What are several key solid waste management issues in your community? Find out about them by reading local newspapers, attending meetings of solid waste planning groups, talking to municipal or state solid waste managers, finding out the viewpoints of local environmental groups or reviewing local budgets for hauling and disposing of trash.

2. Select a local solid waste issue to investigate individually or as part of a small group. Focus on an issue that can be investigated within a reasonable amount of time. For example:
- What can be done if the local landfill is almost full?
- Is incinerating waste for energy an economically and environmentally sound management option?
- What steps could you take to reduce the amount of solid waste you make at home?
- How can people be informed about changing their buying and living habits to reduce how much they throw out?
- How much does the community spend handling trash compared to the budget for education, recreation, snow removal, police and fire protection or housing for the elderly?
- How do different fast-food restaurants compare in what and how much waste they generate?
- How much methane gas is generated from solid waste? Is methane gas a problem? What are possible solutions?
- How much water falls on a landfill during the year? How much of this becomes runoff and leachate? What is done with the runoff and leachate?
- What are the pollutants in leachate? What are the sources of these pollutants? Which are the most harmful?

3. Define your issue as precisely as possible, develop a research question(s) and conduct the research to answer your question. Possible research techniques for collecting data to help answer the question(s) could include telephone interviews, development and use of surveys and questionnaires, and use of both primary and secondary references.

4. Prepare a research report to present in class. The report should include a description of: a) the issue, b) the research question, c) the method of investigation, d) the data gathered, e) how you analyzed the data, f) what conclusions you made from the study (both the knowledge gained and what value that knowledge has) and g) what concepts, values and beliefs influenced why you asked the question, why you selected the research method, and how you interpreted the results.

5. Questions to consider as you investigate your issue and before you decide to take action include:
- Who is involved in the issue and what are their beliefs, values and attitudes?
- What are my beliefs and values about this issue?
- What specific types of action will I take? (persuasive, consumer, political, legal, direct, and/or personal action?)
- Is there sufficient evidence to warrant action on this issue?
- Are there alternative actions that I could take?
- Is the action I chose the most effective one available?
- What are the legal, social and economic consequences of this action?
- Do my personal values support this action?
- Do I understand the procedures necessary to take this action?
- Do I have the skills needed to take this action?
- Do I have the courage to take this action?
- Do I have the time needed to take this action?
- Do I have all of the other resources needed to make this action effective?
- What are the ecological consequences of this action?

(Questions from: **Investigating and Evaluating Environmental Issues and Actions: Skill Development Modules.** See Resources.)

6. If you decide to take action, choose strategies for which there is a likelihood of success within a realistic amount of time. For example:
- Survey litter production on your block, instead of surveying litter production in your entire town.
- Begin by writing letters to the editor of the local paper encouraging people to recycle, instead of aiming to convince the city council to start a mandatory recycling program. You might try to get editorial support for your viewpoint.
- Before trying to set up a community recycling center, see if your family is willing to recycle household wastes for a few months.

7. Add a conclusion to your report that describes the action you took and any results.

More Activity Ideas!

- Invite a member of your city's common council or county board to talk about how solid waste disposal and community recycling decisions are made. Consider giving your guest a list of questions you would like answered before he/she comes to your class.

- Attend a common council or county board meeting to observe local politics in action.

- Note what people in your neighborhood throw out on trash day. Do you see items that could be reused or recycled (e.g. window frames, old appliances, chicken wire, plastic plant trays, grass clippings, leaves, glass bottles, wood scraps)? Why do you think these items are being discarded instead of given away, recycled, or reused? What might you do about this? (e.g., offer to take materials to or contact Goodwill, Salvation Army, recycling companies; hold a yard sale; find others who could use the materials, etc.)

- Read the Dr. Suess story, **The Cat in the Hat Comes Back**. Discuss the concept of "away." Is there such a place? What do you think about the Cat in the Hat's solution?

- Investigate the United States' nationwide efforts to recycle during World War II. What was recycled? Why was recycling during the war so successful? Why is it harder to get people to recycle now?

- Collect and discuss examples of objects that can be reused in ways different from their original purpose.

- Visit a car salvage yard to learn what parts of junked cars are reused or recycled. Note how changes in car design and materials have changed what's considered recyclable.

- Conduct a litter survey of your neighborhood or school grounds.

- Examine the pros and cons of using returnable beverage containers. What states have *"bottle bills"* (beverage container deposit laws)? Contact one or more of these states for information about how the legislation was accomplished politically, how it has been implemented and what impacts it has had on recycling, litter, jobs, public opinion, energy use, etc. Contact Wisconsin legislators, businesses, agencies and organizations and ask for their viewpoints and reasons for supporting or opposing beverage container deposit laws in Wisconsin. What do you think about a state or federal bottle bill?

- Collect photographs of life in other countries. Which countries do you think have the greatest solid waste problems? Why?

- Brainstorm ideas for how you can help reduce solid waste.

- Write slogans and make posters about solid waste problems and solutions.

- Think about how you feel about solid waste — is it ugly or pretty? A problem or not?

- Ask every student in your class to pick up a piece of litter on the way to school. What is litter? What items often end up as litter? Why? How much of what you collect could be recycled? How do you feel about litter? How do you feel about collecting it? Why do we have a litter problem? What is meant by the slogan, "Every litter bit hurts?" Is littering common in other countries? What is different about countries where littering is not common? What suggestions do students have for helping solve the litter problem? Are the suggestions realistic and something you will do?

- Find out what the solid waste management laws are in your community. What are they designed to do? What do you think of them? Do they work well? If not, do you have suggestions for how they could be better?

- Consider the fact that the United States has 6% of the world's population, but uses over 25% of the world's natural resources. What do you think about this?

- Conduct a survey of several fast food restaurants and record the types of packaging (e.g., polystyrene, paper, aluminum foil) they use for similar items (e.g. soda, plain hamburger, fish sandwich, french fries, coffee). Is the packaging necessary? What criteria are you using to make your judgement? If you were concerned about the impacts of solid waste on the environment, which restaurant would you patronize? Could you influence the restaurant to change its packaging policies? How?

- Go to a fast-food restaurant and ask to be served a drink in your own cup or a hamburger on your own plate. Will/can a fast food restaurant serve you? Why or why not? What would people think of you if you asked to be served in this way? What are the health requirements for serving fast foods? Why were these rules made?

- Investigate what manufacturers are doing to reduce the amount of packaging for their products. Report findings to your class.

- Call a manufacturing plant and find out if they are preventing waste through *source reduction*.

- Visit your local solid waste disposal service to learn how it disposes of your community's waste. Visit your local recycling center.

• Gather trash from school or home and design useful objects from it (musical instruments, toys, bird feeders, planters, door stops, etc.) For ideas, write for *Ranger Rick's Nature Magazine Recycling Reprints* (see Resources).

• Examine contents of the classroom trash can at the end of the day. Record each piece of trash as it's removed. Can you reconstruct the day's activities from the clues in the trash can? Are any of the items recyclable?

• Investigate why archaeologists and anthropologists are interested in old garbage dumps. What can studying the contents of old dumps tell us about earlier peoples? What is an Indian midden? What do you think people in the year 3000 would think about our culture if they were to do an archaeological dig in our landfills?

• Select and analyze an article about solid waste management from your local paper. What is the headline? Who, what and where is the story about? What are the conclusions? What do you think about the article? Does it present the facts you need to understand the issue? Does it interpret the facts well? Is it well written?

• Conduct a school or neighborhood yard sale to reuse unwanted objects. What do you think about the saying, "One person's trash is another's treasure?"

• Take a field trip to a nearby woods or old field. Look for evidence of nature's recycling processes. For example, find natural objects that are decomposing (e.g. dead plants and animals, animal droppings, feathers, fur, etc.) and what "decomposers" are assisting this process (e.g. fungi, insects, molds, etc.). Investigate what you find carefully, and discuss what you saw, smelled and felt. Why is decomposition such an important natural process?

• Visit a paper or plastic manufacturing plant. Does the plant use only virgin materials, or does it use recycled instead? What are the pros and cons of manufacturing from virgin materials vs. recycled materials?

• Investigate the Wisconsin tax advantages/disadvantages of using virgin materials vs. recycled materials to make paper. What do you think about these tax laws?

• Investigate how newsprint in your community is recycled. Do many people recycle their newspaper? Why or why not?

• Consider why we've shifted from glass milk bottles delivered at the door to plastic or plastic-coated paper containers purchased at the store? What are the economic, environmental and social impacts of this shift?

• Place 20 objects, both natural and human-made, on the floor. Name the objects and decide if they are natural or human-made and why. How completely do natural objects decompose compared to human-made ones? Which objects are more likely to release harmful chemicals to the environment as they decompose? Research your guesses.

• Find out about ways in which litter harms animals. Investigate the often fatal impacts of: discarded fishing line and plastic six-pack holders on water birds (they can get tangled); old soda or beer bottles on shrews and other small mammals (they enter a tilted, slippery bottle and can't get back out); flip-tops on fish (small fish can get stuck in the rings); and cigarette butts, tin cans and other litter on deer, raccoons and other mammals (they eat the litter or can cut their tongues on sharp edges). Humans also can be hurt. Have you ever cut your foot on broken glass or a discarded nail? Think of other ways that litter can harm people and other animals. How can such problems be prevented? Contact your state legislator for an update on Wisconsin laws that address these problems.

• Contact a glass manufacturing company and ask for an estimate of the amount of energy required to produce, recycle and reuse a ton of glass bottles. What other costs should be considered when choosing which strategy for handling glass is best (e.g., costs of collection and transportation)? What do you think your family should do with its glass? How much energy would your actions use/save? Should we recycle bottles to save energy? Why? What impacts might this have on jobs, the environment, trash removal costs, etc.?

• Set up a recycling plan for your school. Determine what can be recycled, find sources for the recyclable materials, establish a procedure for recycling, elicit support from school organizations (e.g., service clubs could help coordinate the plan, technology education class could make or design recycling bins), discuss your plan with school administrators and present your proposal to the school board. Enact your recycling plan.

• Investigate what happens to old tires. What are the problems associated with tire disposal? Research the causes and effects of the tire fire that began in Somerset, WI, on October 18, 1986. What sources of information can you consult to find out about the fire?

Resources

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Agencies and Organizations

Wisconsin:

Associated Recyclers of Wisconsin, 16940 West Shadow Dr., New Berlin, WI 53151.

Citizens for a Better Environment, 647 West Virginia St., Suite 3056, Milwaukee, WI 53204; 222 S. Hamilton St., Madison, WI 53703.

League of Women Voters of Wisconsin, 122 State St., Madison, WI 53703.

Sierra Club — John Muir Chapter, 222 S. Hamilton St., Madison, WI 53703.

Wisconsin Department of Natural Resources, P.O. Box 7921, Madison, WI 53707. (Recycling Education Coordinator, Bureau of Information and Education, 608-266-2711; State Recycling Coordinator, Bureau of Solid and Hazardous Waste Management, 608-267-7566)

Wisconsin Department of Public Instruction, P.O. Box 7841, Madison, WI 53707.

Wisconsin's Environmental Decade, 112 State St. # 200, Madison, WI 53703.

Wisconsin Industry Saving Our Environment, 606 East Wisconsin Ave., Milwaukee, WI 53202.

Wisconsin Merchants Federation, 30 West Mifflin St., Madison, WI 53703.

University of Wisconsin-Extension, Solid and Hazardous Waste Education Center, Lowell Hall, 610 Langdon St., Rm. 529, Madison, WI 53703; also, contact your County Extension office.

United States:

The Aluminum Association, 900 19th St., NW, Suite 300, Washington, DC 20006.

American Paper Institute, 1250 Connecticut Ave., NW, Suite 360, Washington, DC 20036.

American Plastics Council, 1275 K St., NW, Suite 500, Washington, DC 20005.

Environmental Defense Fund, 257 Park Avenue South, New York, NY 10010.

Environmental Action, Inc., 1525 New Hampshire Ave., NW, Washington, DC 20036.

Glass Packaging Institute, 1801 K St., NW, Suite 1105-l, Washington, DC 20006.

Institute of Scrap Recyclers, 1325 G St., NW, Suite 1000, Washington, DC 20005.

Keep America Beautiful,Inc., Mill River Plaza, 9 West Broad St., Stamford, CT 06902.

Polystyrene Packaging Council, 1025 Connecticut Ave., NW, Suite 515, Washington, DC 20036.

National Recycling Coalition, 1101 30th St., NW, Suite 305, Washington, DC 20007.

National Wildlife Federation, 1400 16th St. NW, Washington, DC 20036.

Steel Can Recycling Institute, 680 Andersen Dr., Pittsburgh, PA 15220.

U.S. Environmental Protection Agency, 401 M Street SW, Washington, DC 20460; Region V, Office of Public Affairs, P-19J, 77 West Jackson Blvd., Chicago, IL 60604.

The purpose of Department of Natural Resources study guides is to help increase Wisconsin citizens' knowledge about and understanding of our state's environment. We hope to provide information about important environmental issues, encourage respect for the environment and help citizens become active stewards of our natural resources.

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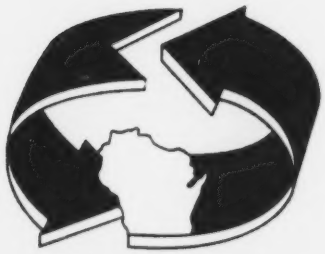

The Fourth "R"

An Action Booklet for Waste Reduction and Recycling in the Classroom and School

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"As teachers, we meet the future every time we open the classroom door. We share the accumulated knowledge and experience of our generation with our students, offering them lessons in how to better manage the world they will inherit. But advice isn't the only thing we'll be passing along to future generations; they'll also inherit an unavoidable legacy — garbage!" [1]

Let's face it. We have a garbage crisis. The problem is not new. Throughout history garbage has been a dilemma, and with our recent change to a throw-away society, the dilemma has grown into a crisis. Recycling resources, reducing consumption and reusing materials are some solutions to this problem. However, these solutions will require fundamental changes in institutional policies and individual behaviors.

Educators and educational institutions are frequently called upon to address issues when behavioral changes are needed. The garbage crisis is no exception. We are at a point in time which educators' refer to as a "teachable moment". Garbage and recycling are on everyone's mind. Teachers are being asked to address this issue by community leaders, and students are asking their teachers questions about it.

Now is the time to add a Fourth "R" — recycling — to the traditional three "R's" of reading, 'riting and 'rithmatic. Fortunately, Wisconsin already has the **Recycling Study Guide** and other educational materials for teachers to use. Many teachers are already teaching recycling in the classroom. But will just teaching about recycling really initiate the attitudinal and behavioral changes required to solve the garbage crisis? Probably not. We must practice what we teach; we must practice recycling, reducing and reusing to reinforce positive behaviors for dealing with our wastes.

This booklet is designed to do just that. Department of Public Instruction curriculum consultants and teachers from all over Wisconsin have contributed their ideas to help you practice recycling, reducing and reusing in the classroom and throughout the school system. Use this booklet as a guide to help your class and school get involved with an issue where they can have an impact.

" As a nation and as citizens of the world, we need to generate less trash by choosing our disposable items wisely and by carefully considering how they will eventually have an impact on our world. We need to create not only an interest in, but a strong social pressure toward recycling." [1]

[1] "Practice What You Teach" by Juliana Texly, **The Science Teacher**, February 1990.

I. Daily Practices in the Classroom

All Grades/Classes:

- Separate classroom trash into paper vs. non-recyclables.
- Keep a scrap box for various papers (one-sided, construction, small scraps, etc.)
- Use both sides of paper for reports, homework assignments, drawings, note-taking, work sheets, etc. Create a class motto, such as "Be Nice, Use It Twice!"
- Make note pads from used paper.
- Have a "Save A Tree Day"— teach without using paper.
- Use white or (even better) unbleached paper when possible. Some dyes are contaminants and cannot be used in producing high quality recycled paper (check with your paper recycler).
- Require separate or special notebooks only when absolutely necessary.
- Require use of loose leaf notebooks instead of spiral notebooks. The binders are reusable and the paper is easily recycled.
- At the end of the year, stack notebooks for re-cycling. Remove spiral bindings and cardboard. **Or**, if much of the notebook is unused, encourage students to flip the notebook over, making the back cardboard the front cover, and use it again.
- Use paper towels conservatively.
- Reuse bulletin board paper for more than one month or one season.
- Reduce use of work sheets or put plastic sleeves over work sheets. Have students write with crayon and erase with carpet squares. Plastic sleeves are available from Dorfman Products in California.
- Maximize use of overhead projector and blackboard to minimize use of dittoed directions and information in the classroom.
- Keep a swap box for records, games, tapes, puzzles, toys, books, and magazines in the classroom. Students who bring items from home to be reused can place their names on a sheet and list what they bring (IN) and take (OUT).
- Use cooperative learning and manipulatives (hands-on activities) when possible. These save on paper and offer other benefits.
- Obtain masonite boards, roughly 12" x 18" or 8" x 12", depending on the size of the kids' handwriting. Paint these with two coats of chalkboard paint, "cured" by rubbing chalk across the board, and washed with a wet cloth. (Recycled, of course.) The rule-of-thumb on chalkboard paint is one pint per classroom. Students can use chalk to do their work and when the signal is given each of them can hold the board up in the air so that the teacher can see each student's work. Eraser? Old socks or small carpet scraps. Ask students to figure out a way to estimate the amount of paper saved (reduced) by using the boards for a specified period of time.
- Use "wipe clean" cards or "magic slates" when figuring math problems or practicing writing.
- When giving multiple choice tests, use testing sheets (like Scantron), as they are 1/4 the size of regular paper and can be machine scored.
- Use the computer for drill and practice.
- Encourage use of pencils and crayons rather than throw-away plastic pens and markers.
- With older students, encourage use of refillable pens and mechanical pencils rather than throw-aways.
- Use tape and staples sparingly.
- When changing classroom aquarium water, use it to water classroom plants.
- Turn off the lights when the classroom is not being used.
- Use items collected from home (food containers, etc.) for storage.
- Take care of books, computer diskettes, and other school materials so they last.
- Put a table in the hallway at the end of the year for students to put unwanted pencils, notebooks, etc. on. Bring the box of materials out at the beginning of next year for students to take and use these items.
- If school policy allows, have each student keep a reusable plastic or porcelain cup in the classroom for beverage breaks, treats, and parties. Younger students can decorate plastic cups with paint pens.
- Have students and staff place recyclable waste in regular waste baskets and place non-recyclables in centrally located trash barrels.

- Have students bring in the fronts of used holiday cards and place them in a box. Throughout the year have students cut them to regulation post card size. (3 1/2" x 5" to 4" x 6") Have them draw a line to divide the card so that one side can be used for the address and the other for the message. These cards are used for special class projects or by individuals to write thank you notes or notes to friends. Ask students to bring in a stamp and mail the cards from school.
- On field trips:
  - → bring soda cans back to school for recycling.
  - → bring work sheets on homemade clipboards and tie pencils to the clipboards.
  - → encourage students to use lunch boxes and reusable containers.
  - → bring a box for unwanted apples and oranges; make these available for snacks later on.
  - → bring a bag for picking up litter.

Art :

- Ask local industries, galleries, and print shops to donate materials they intend to discard that would be useful in your class (latex paint, paper, plastic containers, etc.)
- Use fabric scraps to wash art room tables. Let tables air dry when possible.
- Keep a box of construction paper leftovers for students to use when they need small pieces for a project.
- Use items collected from home (food containers, packaging etc.) for paint pans or clay sorting.
- Use pictures from magazines for art projects.
- Use scrap paper, cloth, and wood from other classes.
- Attempt to reduce the "supplies" budget for art classes for one year as an experimental alternative to expensive commercial traditions.
- Do not throw away broken crayons — use them!
- Make projects out of natural or recycled materials when possible.

Family & Consumer Education:

- Utilize manufacturing simulations to minimize the need to purchase various supplies.
- Prepare small samplings of food products during labs to discourage wasting of foods.
- Make garments, toys, or games from recycled or reused materials.
- Alter and mend garments (saves on buying new garments). Change clothing to a new "style" by adding a scarf or other accessary.
- Keep swap boxes for used or unwanted patterns, buttons, material, notions, etc.

Technological Education:

- Save wood shop scraps for firewood (kindling) or art projects.
- Take care when using treated lumber. It contains poisonous chemicals— the sawdust is toxic.
- Sawdust recycling: See **Wisconsin Technological Education Manufacturing Activity Guide**.
- Collect and repair old tools.
- Cooperate with local industries to supply you with parts, tools, supplies and waste wood they might discard but would be of use to your class.
- Use home collections of left-over latex house paints for projects.
- Use household containers in your activities (example: model rocket).
- Recycle used motor oil (look for used oil receptacles in your community).

Science:

- Make aquariums, terrariums, planters, scientific apparatus and tools from plastic bottles, jugs, utensils and other recyclables (Bottle Biology Resources Network, U-W Madison, 1630 Linden Dr., Madison, WI 53706).
- Design "mini-labs" using reduced quantities of chemicals and other supplies.

Creative Reusing:

Here are some suggestions for re-using various materials in your classroom:

Use ...	For ...
attendance sheets	scratch paper
baby food jar	beakers, storage
carpenter shavings	classroom animal bedding
cereal box	poster backing
checkbook box	pencil/crayon box
coat hanger	mobiles
construction paper scraps	book marks
deodorant roll-on	tracing numbers, writing practice
egg carton	seed collections
film canister	paste jars, bug collections, soil samples
frozen juice container	paint or water when painting
magazine pictures	creative writing illustrations, art projects, report covers
metal can	pencil holders
milk cartons—plastic or paper	bird feeders
old tire	playground apparatus, flower/vegetable planters
one or two liter clear plastic bottles	mini-terrariums, compost bins, aquariums
paper grocery bag	text book cover, newspaper bundler (no strings!)
paper towel rolls	sending home papers with younger students
permanent wave bottles	glue bottles
plastic laundry detergent bottles	containers for pencils, crayons, etc.
plastic lids	petri dishes, observation trays
plastic milk jugs	banks, art projects, hold water for activities
plastic peanut butter, cottage cheese, yogurt containers	test tube holders
polystyrene packaging (cups, burger containers, etc.)	art projects
small milk carton	paper weight or planter
toilet tissue cores	bird feeders (roll in Peanut butter and seed)

II. Reduce, Reuse, and Recycle Throughout the School

General/Office/Administration:

- Make small pads of paper from scrap memos and dittos. Distribute to all teachers.
- Use "stickum" slips at a minimum, recycle used paper for notes.
- Reuse or recycle computer paper.
- Have rubber stamp made for hall passes and make passes on used paper.
- Maximize sharing of periodical print material within building to minimize the number of copies needed. Make students aware of the effort.
- Use recycled paper in your school and for school stationery. Successful recycling requires a market for products made from recycled materials — so schools should both supply *and demand* recycled products. See Resources for sources of bulk recycled paper.
- Use both sides of paper for all correspondence.
- Jot down main ideas of articles for teachers rather that duplicating entire articles. Keep articles on file for teachers who would like to read them.
- Write labs, tests, assignments, correspondence etc. on the computer and store on disks. Editing can be done without wasting paper.
- Assign school clubs or classrooms with recycling responsibilities (setting up bins, collecting and transporting materials, sorting, etc.)
- When installing updated copy machines in the office, invest in a two-sided copier. A duplex copier may cost more than a single-sided copier, but savings in paper and filing space will make it cost-effective. Post clear instructions next to copier to make the process user-friendly.
- To save on office paper:
  - → write messages to teachers on partial pieces of paper.
  - → use routing slips to circulate memos
  - → post memos on a central bulletin board
  - → use the P.A. system for all morning announcements
- Order supplies in bulk to reduce packaging.
- Ask to be removed from junk mailing lists, obtain a form at the local post office to remove names of employees from third-class mailing lists, from which most junk mail comes. Or you can write to Mail Preference Service, Direct Marketing Association, P.O.Box 9008, Farmingdale, NY 11735.
- Use white paper or (better still) unbleached paper instead of colored. White paper may be a higher grade than colored ledger on the recycling market and may sell for many times the price. Unbleached paper may not be as valuable for recycling, but it may be better for the environment (less pollution in production).
- Keep a box in the office for scrap paper for use in writing memos, teacher messages, announcements, etc.
- Maintain central files or computer files instead of filing everything in multiple files.
- Put the school on a mailing list of an environmental periodical so you will receive current information about recycling. See Resources.
- Post current prices for recyclable materials on a bulletin board.
- Put news and achievements regarding recycling in your school in the daily announcements.

Library:

- Reuse paperback books and magazines. Place a shelf in the room where students place books they bring in and exchange for others. Students who bring books in and who do not find a trade can place their names on a sheet or take a token for later exchange. Make sure the students' names are in their books so they will be returned to the proper owner.
- Sell or give away old books. Perhaps donate them to local charitable organizations, libraries, or organizations doing educational work in foreign countries.
- Save old films and filmstrips for art and other creative projects.
- Save magazines for art and current events projects.
- Recycle newspapers.

Teachers' Lounge:

- Collect coffee grounds for composting.
- Share magazines with others.
- Put boxes and bins in the teachers' lounge for collecting recyclables.
- Set up a rack for teachers to hang their mugs or cups.
- Get extra mugs for visitors.

Cafeteria and Food Service:

- Set up recycling bins in the cafeteria. Designate bins for aluminum, uneaten fruit, other food waste, and other specified recyclables. Use uneaten fruit for snacks, empty contents of the unwanted fruit bin into the school's compost pile several times a week **or** give to a local farmer or garden club.
- Distribute milk from a dispenser rather than in separate milk cartons, use washable glasses, or purchase milk in returnable or recyclable cartons.
- Use straws only when necessary.
- Use washable, reusable trays, plates, bowls, glasses and utensils.
- Recycle cans and bottles from the kitchen.
- Separate out compostable materials such as clean vegetable and fruit scraps and coffee and tea grounds. Add these to yard materials; have students or grounds personnel compost and use these materials as fertilizer for the school gardens, lawn, and indoor plants.
- Reuse bulk containers for storage. Share extras with teachers and/or community groups.
- Encourage students to:
  - → bring their non-perishable lunch leftovers home so the food will be eaten rather than thrown away.
  - → eat healthy foods which have minimal packaging.
  - → use reusable containers and lunch boxes to store their lunch items.
  - → take only what they can eat.
  - → use lunch boxes **or** reuse their lunch bags.
  - → throw their aluminum cans into the cafeteria's recycling bin (a good fund raiser).
  - → take only one napkin.

Custodial/Maintenance Staff:

- Solicit help from classes and/or student clubs in maintaining grounds (picking up litter, tending to shrubs and gardens, etc.)
- Set up a visible place in the school for teachers to put "extra" work sheets. As the number mounts it can serve as a visual reminder to teachers and students.
- Set up area in school building for storage of cardboard boxes for recycling. Every week have one class be responsible for flattening the boxes for recycling.
- Install automatic room controls for lights. Install ceiling fans to replace AC units.
- Eliminate or reduce use of plastic trash can liners.
- Replace paper towel dispensers in washrooms with cloth roll or warm air type dryers.
- Put trash cans on the playground for candy wrappers, etc.

III. Educational Activities

All Grades/Classes:

- Develop a recycling display for use during parent-teacher conferences, American Education Week, and other such events. Themes could include:
  Environmental Shopping; Composting; How To Reduce, Reuse, and Recycle; Natural Cycles; Renewable vs. Nonrenewable Resources; Recycling Demonstration; Model Landfill; What Our Community is Doing About Solid Waste.
- Have your school give out an annual award for the best classroom resource conservation ideas. Send ideas to the Recycling Education Program at the Wisconsin DNR.
- Make use of foreign exchange students within the school and their cultural information concerning resource recovery in their country.
- Fill washed, empty egg shells with soil and plant seeds. As plants begin to grow the shell and all can be planted — the shell will decompose and nourish the soil.
- For younger students, make instruments from the following materials:
  Tambourine — 2 aluminum pie tins, paper plates and large bottle caps
  Castanets — bottle caps, baby food jar lids
  Banjo — wrap rubber bands around an open cigar or shoe box
  Maracas — fill small plastic jars with beans or rice
  Drum — a coffee can or other large can
- Develop a list of environmentally safe school supplies and use them!
- Put posters on the walls of the schools alerting students to practice reducing, reusing, and recycling.
- Plant trees. (Perhaps manage a school forest for pulp trees.)
- Develop Public Service Announcements or Consumer Bulletins and place them in the school or local newspaper and radio stations to educate people about recycling. Some of these could be oriented toward specific target groups.
- Have students make a presentation to the school board regarding recycling policies. For example:
  → Students can explain what they are doing to conserve in the classroom and to encourage the board to make their policies conservation-oriented.
  → Students research different areas of waste in your school (food, paper, plastics, etc.), develop and present ideas on how to reduce this waste.
- Have a Reuse Day at school. Have students wear clothing handed down from someone else and bring in materials which have been re-used instead of thrown away.
- Have students research, write, act in, and produce a video tape (15 minutes max.) on:
  Recycling in the home, composting, proper disposal of household hazardous waste, or environmental shopping.
- To generate student concern about the issue, show films/videos on the impact of refuse on animals, drinking water, and other resources that directly affect students' lives and interests.
- Go on litter pick-ups regularly and sift through trash to find recyclable materials.
- Make new toys out of old toys or recyclable materials.
- With younger students, collect old tape recorders, record players, clocks, phones, etc., put them on a "take-apart" table, and have students take them apart to see what is inside. Save knobs and other interesting components and conduct an "Invention Convention".
- Teach students how to make a compost pile. Start a compost pile and either sell/give away the compost to a local farmer or gardener **or** use on schoolyard plantings. See the **Recycling Study Guide** for more composting ideas.
- Take your class on a 1-3 mile Ecology Hike or Wellness Walk to a nearby park and collect garbage on the way. Separate the garbage into recyclables and non-recyclables. Bring the collected garbage back to school and graph what you found. This information can be compared from year to year. Celebrate cleaning your area by having a picnic at the park using re-usable and recyclable containers and tableware.
- Have high school sociology classes design and conduct a survey to help determine what type of recycling program would be best for your school.
- Have older students read **A Sand County Almanac** by Aldo Leopold. Discuss Leopold's views regarding the management and our responsibility for our resources. Pay particular attention to the essay "A Man's Leisure Time". Gary Laib, Poynette High School, Poynette, WI 53955 has an activity guide for this book and essay.
- Give students addresses of local recycling collection centers and encourage students to take these home to their parents.

- Bury some trash from the classroom in the ground in September and uncover it in May to see how biodegradable each item is. Hang photodegradable plastic where it will have exposure to the sun and monitor its changes.

Art :

- Create "sit-upons" out of cardboard or plastic.
- Teach a unit on product and packaging design which includes design consideration for recycling and reducing packaging materials.
- Design recycling graphics to put on boxes for collection of cans and paper.
- Design new cards and wrapping paper by using pieces of old birthday cards, tissue paper, and grocery bags students bring from home.
- Make puppets from used lunch bags.
- Make "New Depression Art" or "Junk Art" — mobiles, sculptures, robots, etc. — using collected objects.
- Make paper from used paper, cloth, and string. Do paper molding projects or collage art with paper making by adding recycled colorants, such as paints, vegetable dyes, coffee, etc.
- Make papier-mache' projects (flower pots, waste baskets, recycling bins) from newspaper.
- Decorate paper bags and use them for collecting recyclables.

Family & Consumer Education

- Develop a unit or module on consumption/waste, it could include:
  - → a concept analysis of the meanings of consumption and waste.
  - → an examination of how culture and background influence attitudes and behaviors of consumption and waste.
  - → a discussion on future trends/prospects of American consumption patterns on resources in the future.
  - → an examination on what the various forms of media portray in regard to consumption, packaging and waste.
  - → a discussion of factors that cause changes in American consumption and waste patterns.
  - → surveys of various age groups for views of consumption and waste.
  - → identification of values/beliefs associated with specific patterns on consumption and waste.
- Set up a home recycling system in class: collect and recycle newspaper, aluminum, plastic, tin, glass, etc.
- Promote a "waste-less" campaign in the school or community as a class or FHA-HERO project.
- Have students investigate products/items that they buy. Have them check to see if the packaging is recyclable, and if not, what recyclable substitutes can be found.
- Have students develop a list of products that use too much packaging, find the names and addresses of the manufacturers, and write to them expressing their concerns and suggested alternatives.
- Invite a local landfill manager, recycling center operator, waste disposal service worker, etc. to speak on solid waste concerns and ways the community could waste less.

Technological Education:

- Conversion of food by means of methane generation: using food waste from school cafeteria discover how methane gas may be produced. Basic materials — food scraps, livestock manure, water, mixing apparatus, 5 or 10 gallon containers, valves & balloons.
- Conversion of plastic by means of combustion: burn identical weights of different kinds of thermoplastics, determine the combustion efficiency by determining which plastic raises the temperature of a given amount of water the highest.
- Conversion of paper by means of combustion: as for plastics above.
- Recycling paper by means of paper making: use newspaper, magazines, rags, etc. to form new paper from pulp.
- Aluminum recycling by means of casting: melt scrap aluminum in a foundry and cast into new products.
- Build a paper baler or can smasher. See Bame-Cummings **Activity Manual**, Davis Publications for instructions.
- Conduct an environmental impact study. See **Understanding Technology Activity Guide** by Davis Publications.
- Conduct a home energy audit. See **Understanding Technology Activity Guide** by Davis Publications.
- Solicit old technical journals from local industries for students to use.
- Repair small appliances, lamps, electric motors,small gas engines, etc.
- Refinish and repair wood furniture.
- Build recycling and composting bins for school or community use.
- Build projects with "plastic lumber" made from recycled plastic.

IV. Taking It Further: Special Projects for the School, Community Service, and Fund Raising

- Use recycling as a year-long club project.
- Donate money collected from recycling to:
  - → Local charities
  - → Buy bird seed for the school's bird feeding station
  - → Support school recycling activities
  - → Purchase equipment for students with special needs
  - → Support special field trips and projects
  - → School environmental education activities
  - → Supporting local, state, or national conservation organizations.
- Develop booklets, coloring books, and skits on recycling.
- Develop a reading area or site in the Library/IMC that would include up-to-date information and articles concerning the solid waste issue and recycling. Include information on selective shopping.
- Recycle old textbooks. See Resources.
- Establish a school account at the local recycling center. Payments for materials brought in by parents and community members can, in this way, be credited to fund school projects.
- Repair toys for school children or an empty stocking club.
- Have a Repair Workshop Day sponsored by the shop class. School and community members can bring bicycles, small appliances, tools, etc. to the workshop for repair. This could be used as a fund raiser.
- Make and sell newspaper logs. Wrap newspaper tightly around a broom stick (use twine or thin wire to hold the roll tight), soak in water, remove broom stick, and dry thoroughly.
- Conduct various recycling drives throughout school.
- Host a technology fair at the high school level. Develop/display new products made from recycled materials.
- Host an art fair featuring art from recycled items.
- Conduct a Recycling Invention Fair or Invention Convention.
- Have students plan and conduct an annual garage sale to encourage re-using.
- Make "pet" litter and animal bedding from newsprint. Have kids shred the paper, package it, and sell it!
- Repair tools or appliances and give to needy citizens.
- Collect old school books, clothes, and toys for the needy.
- Make reusable shopping bags out of heavy fabric, silkscreen a logo on them and sell them as a fund raiser.
- Make quilted shades for school windows to help conserve energy.
- Use cloth scraps and rags to make rugs, quilts, school banners, shopping bags, and other projects.
- Make recycled holiday cards for senior citizens and needy people to use.
- Collect and distribute magazines for senior citizens and the needy.
- Implement an all-school Project Earth program for the school year. Designate each month for a special topic (Endangered Species Soil, Water, Land Use, Pollution, etc.). Incorporate solid waste management into one of these themes.

V. Setting Up a School Recycling Program

A school recycling program may not make money, but it will cut down on waste and disposal costs. It also reinforces positive behaviors associated with conserving our natural resources. The school will teach by setting an example and all of society will benefit.

Before you start a recycling program, find out what can be recycled in your community. Check the yellow pages under "Recycling". Call community or private recycling centers and buyers of recycled materials. Your municipality or county may already have a program that you can participate in — call your Departments of Public Works or Solid Waste Management. They have several publications from the Department of Natural Resources that will help you find recycling programs in your community. Next, inventory your school's trash to determine what types and amounts of waste you are generating and what is recyclable. Once you find out what is recyclable in your community and what makes up your waste stream, you can set up your program.

Some helpful hints:

- Before you recycle — reduce the amount of material requiring disposal by purchasing durable and reusable products, buying products in reusable containers or in simple packaging, buying in bulk, and following the suggestions in the other sections of this pamphlet.
- A school recycling program may be organized through:
  - → school district administration
  - → school building's administration
  - → student council or other student organization
  - → student organization
  - → teacher or class
  - → community recycling project
- Program organizers should work with students and the administration, teaching, cafeteria, and custodial staff in setting up the project.
- If a school wishes to receive financial compensation for recyclables, it may have to deal directly with buyers of recycled materials or coordinate this effort with its local unit of government.

- Students can do most or all aspects of the program including purchasing and waste stream surveys, market analysis, project development, container design and construction, promotion, collection, and monitoring.
- Use a special event or rally to "kick off" the program and provide periodic feedback and recognition to participants.
- Recycling containers should be easy to identify and readily accessible to everyone that needs to use them.
- Although schools generate large quantities of MIXED SCRAP PAPER, it may be preferable to keep LEDGER, KRAFT (brown bags), and NEWSPAPER separate. Check your local markets. LEDGER or white office paper is higher quality and may be the easiest to sell. If this is your most marketable item, consider using white paper for most of your paper needs.
- Make it clear to all participants that certain contaminants common in school facilities must be kept out of recyclable paper: paper towels, facial tissues, cellophane wrappers, stencils, carbon paper, and waxed paper.

VI. Resources

Purchasing Products with Recycled Content:

Recycled Products Clearinghouse, Wisconsin Department of Administration, Bureau of Procurement, 101 East Wilson, 6th floor, P.O. Box 7867, Madison, WI 53707. 608/267-1820.

Periodicals/Newsletters Containing Recycling Information:

AROW Newsletter, Associated Recyclers of Wisconsin, write to: Bill Tarman-Ramcheck, c/o City of Wauwatosa, 7725 W. North Ave., Wauwatosa, WI 53213

Audubon Activist, National Audubon Society, 950 3rd Ave., New York, NY 10022

Biocycle, 419 State Ave., Emmaus, PA 18049

EE News: Environmental Education in Wisconsin, Wisconsin Department of Natural Resources, Box 7921, Madison, WI 53707.

Garbage, Dovetail Publications, The Black Tavern, 2 Main St., Gloucester, MA 01930

Resource Recycling, P.O.Box 10540, Portland, OR 97210

Waste Age, Suite 1000, 1730 Rhode Island Ave., NW, Washington D.C. 20036

Wisconsin Natural Resources Magazine, Wisconsin Department of Natural Resources, Box 7921, Madison, WI 53707

Recycling Textbooks:

International Book Project, 1440 Delaware Ave., Lexington, KY 40505. 606/254-6771

Finding Recycling Markets:

Wisconsin Recycling Markets Directory: Buyers and Users of Recyclable Materials. 1993. Publ SW-089. Wisconsin Department of Natural Resources, P.O. Box 7921, Madison, WI 53707. 608/267-7566. Or, contact your local unit of government responsible for recycling; most local units of government have a copy.

Implementing Recycling Programs:

Business & Commercial Recycling: A Guide to Recycling in the Workplace. 1992. Publ SW-050. Wisconsin Department of Natural Resources, Waste Reduction and Recycling Section, P.O. Box 7921, Madison, WI 53707. 608/267-7566.

Community-Based Waste Recycling: How to Get Started, Publ. B3444, University of Wisconsin Cooperative Extension. Contact your County Extension Office.

Educational Resources:*

K-3 Supplement to Recycling Study Guide. 1990. PUBL-IE-049. Wisconsin Department of Natural Resources.

Nature's Recyclers Activity Guide. 1990. PUBL-IE-043. Wisconsin Department of Natural Resources.

Nature's Recyclers Coloring Book. 1990. PUBL-IE-042. Wisconsin Department of Natural Resources.

Recycling Study Guide. 1993. PUBL-IE-020. Wisconsin Department of Natural Resources.

*These are available from:

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The Fourth "R" Pledge

Become an official "Recycling School"! By signing the pledge below, your school will be recognized as a fine learning institution that teaches and practices the Four "R's" — reading, 'riting, 'rithmatic and recycling. For your participation, you will receive local recognition (a news release will be sent to your local paper), a "Recycling School" sticker for your entrance door and a recycling education packet.

Sign the **Fourth "R" Pledge**, fill in your school's name and address and mail to:

Recycling Education Coordinator
D.N.R., IE/6
Box 7921
Madison, WI 53707

The Fourth "R" Pledge

We recognize that the garbage crisis is an issue facing all of us today and that we must do our part as students and educators to help solve this problem. We believe that we can help by recycling resources, reducing consumption, and reusing materials. We pledge to teach and practice the Fourth "R"—Recycling — in our school building and to set a positive example for others in our community.

_____ _____

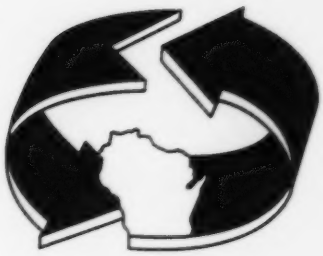
Principal's Signature Date

Name of School _____

Address _____

_____ Zip Code _____

County _____



Nature's Recyclers

Activity Guide

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To Naturalists/Interpreters:

Glass, tin, paper, aluminum, oil... With Wisconsin's recycling law, people are busy recycling. Many of us don't realize that while we are washing, stomping, and separating materials, other creatures are also busy recycling. Lichens, mushrooms, sow bugs, earthworms and beetles spend their whole lives recycling for nature. Nature's recyclers are responsible for turning dead plants and animals back into usable nutrients for new plants and animals. Likewise, humans are responsible for turning garbage back into reusable materials.

Parks and outdoor recreation areas are prime locations for demonstrating the importance of recycling. The natural setting provides visual examples of cycles, recyclers, and natural resources. You can use these visual aids to make connections between natural and human recycling, and between recycling and preservation of natural resources. In addition to the physical setting being ideal, the atmosphere is too. People coming to parks to relax and enjoy resources are generally more receptive to recycling hints and ideas that will help save the natural resources they love.

This activity guide book is intended to help you teach people about natural recycling, cycles in nature and the important role people must play in recycling our natural resources.

The activities include things to do outdoors, indoors, at the property and back at home or school. They are organized by categories: **Activities**, **On-Site/Take Home**, **Games**, **Crafts**, **Songs**, **Plays**, and **Exhibits**. Each activity is laid out in the same format. You can assess the age level of the group, decide whether your goal coincides with the written goal, brief yourself with the background, gather materials and then perform the procedural steps. With any remaining time, encourage the group to partake in the activities listed in the **Going Beyond** section. A **glossary** is also included for your convenience.

This guide is designed for use with people 5 years old and older. You are encouraged to tailor the activities to meet each individual group's needs.

When leading groups and involving them with nature's recyclers, remember to use your basic interpretive skills. Also, remember that action is better than a thousand words. Let them feel it, touch it, smell it, and see it, not just hear it.

Trash Hunt

Age: 6-12 years old

Goals: To develop an awareness of littering and the problems it can cause, and to clarify the difference between litter and trash, renewable and nonrenewable resources, and recyclable and nonrecyclable items.

Background:

A knowledge of the definitions for the following pairs of words will make the discussion more interesting: litter and trash, recyclables and nonrecyclables, renewable resources and nonrenewable resources, and biodegradable and nonbiodegradable. These can be found in the glossary.

Not only is litter undesirable to look at, but it can also be harmful to wildlife.

- Little fish can swim through the pop-top of a soda can and get stuck.
- Birds, larger fish, and small mammals can be strangled in the loops of plastic six-pack holders.
- Loose fishing line can get wrapped around the legs, wings and beaks of water birds, impairing their movement and strangling them.
- Some wildlife may even mistake shiny litter for food. When pop-tops and bottle caps are eaten they can cause injury. Styrofoam cups, plastic cellophane wrappers and cigarette butts have been found in the stomachs of deer.
- Broken glass, edges of opened cans and empty jars are all dangerous. Animals can get cut, get infections and even die. They also can be trapped in slippery glass jars.

Some people are promoting biodegradable plastics as a partial solution to our litter and landfill problems. These plastics are made with a starch or yeast that binds the plastic polymers together. When they "break down" in the environment, the starches or yeast decompose but the plastic polymers remain.

Biodegradable plastics help our litter problem, but not our landfill problem. When buried in a landfill, they do not break down for a long time because of the lack of oxygen. In addition, starches and yeast may contaminate plastic that could otherwise be recycled.

Materials:

1 trash bag per pair (reuse old shopping bags)
1 pair of gloves per pair

Procedure:

1. Have a discussion with the group about litter. Explain the difference between litter and trash. Ask: How do you feel about litter? Why do people litter? Does nature litter? What happens to nature's litter?
2. Explain that the group's mission is to find litter in the area. It doesn't matter how big or small the pieces are.
3. Distribute bags and gloves to every pair. Set a time limit and boundaries to avoid stragglers. Set them free on their mission.
4. After the hunt, gather the group in an area sheltered from the wind. Have the children dump their litter in a pile in front of the group.
5. Pick through the pile. Find litter that is harmful to wildlife and explain how it's harmful.
6. Define renewable and nonrenewable. Have the children sort through the pile picking out examples of each.
7. Define recyclable versus nonrecyclable. Have the children decide whether the litter pieces should be put in a trash can to go to the landfill, or in a box to be recycled.
8. Define biodegradable and nonbiodegradable. Have the children decide which litter is biodegradable and which is nonbiodegradable. Discuss the pro's and con's of biodegradable plastics.
9. Dispose of the litter properly.

Going Beyond:

- Use some of the items collected during the hunt in the Mini-Composts activity.
- Put the money made from collecting recyclables towards educational materials.
- Sing the litter songs in the Sing Along section of this booklet.
- Create a "trash monster" or trash collage with the collected litter.
- Draw before and after pictures of the cleaned up area. Have the children write stories to go along with their pictures.

Litter — It's Everywhere!*

Age: 8-15 years old

Goals: To make people more aware of litter and to encourage them to think of ways to help curb our litter problem.

Background:

Food wastes from snacks, extra packaging, soda cans and paper may all be found in your area. Factors contributing to this problem may include: not enough trash cans, careless campers, the wind blowing trash against a fence, or uncovered trash cans. (For more information, see the background section in Trash Hunt).

Materials:

1 map of the nature center area/park per person
clip boards
writing utensils

Procedure:

1. Discuss litter and what a problem it is, both at the park and elsewhere. Talk about why people litter, and what can be done to help reduce litter (recycling, reusing, more conveniently placed trash cans, etc.)

2. Give each person a map. Ask them to fill in the details of the area (building, parking lots, campsites, trees, play equipment, pop machines, beaches, fences, trash cans, streets etc.) Display a legend of items for them to use.

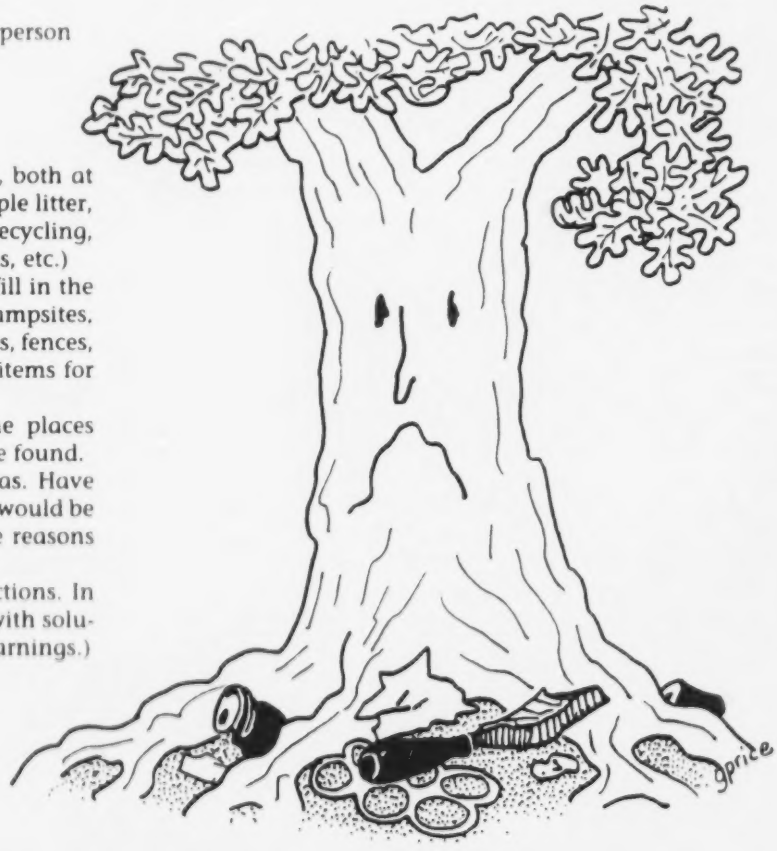
3. Tell them to circle on their maps the places where they predict that the most litter will be found.

4. Encourage people to explain their ideas. Have them consider what types of litter they think would be found in the yard, and ask for any possible reasons they have to explain this.

5. Go out on a walk to check their predictions. In key littering locations, have them come up with solutions (e.g.,"No Littering" sign, trash cans, warnings.)

Going Beyond:

- If the group comes up with a great solution, tell them you'll implement it. If it's a school group, write to them in a few weeks to let them know how their solution is working.
- Suggest that the school group redo this activity for their school grounds. Have them make suggestions to the principal and school board on ways to reduce litter. Suggest that they have a member of an environmental group talk to the class about pollution problems and solutions.
- Do the Trash Hunt activity from this booklet, or incorporate the ideas from the activity into the discussion.
- Sing the songs related to litter from the song section.



* Adapted from: **Oscar's Option**. Ocean State Clean Up and Recycling. Dept. of Envir. Management. Providence, RI. 02908

Spore Prints

Age: 6-adult

Goal: To introduce people to one of nature's recyclers — the mushroom.

Background:

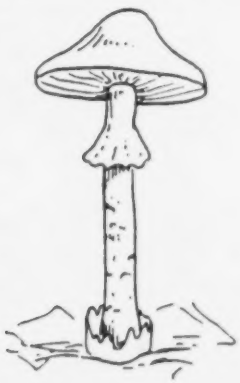
Mushrooms belong to a group of living things called fungi. A fungus is a plant that does not contain chlorophyll. It isn't green. It can't make its own food through photosynthesis. It must gather its food from decaying and living matter. Mushrooms are important members of nature's recycling team. These decomposers chemically break down dead vegetation, animal bodies, and manure into usable nutrients.

The part of the mushroom that people see, the fruiting body, is only part of the whole plant. The rest is hidden in the substrate. Mushrooms grow from spores which are tiny seed-like structures. A little thread, called a hypha, grows from each spore. The hyphae grow and become entangled with one another, forming masses of hyphae called mycelia. As the mycelia grow, chemicals are released which dissolve the object leaving food for them to eat.

When the conditions are right, small mushroom "buttons" begin to form beneath the soil. The buttons take in water, swell, and push up out of the ground. Gradually the stem grows, the cap opens, and flattens. The mushroom ripens and disperses its own spores — thus starting the cycle over again.

Use mushrooms from the grocery store rather than from your property because natural supplies could be permanently depleted. This provides a nice opportunity for people to learn by example that nature can be observed without being ruined.

In this activity you will see ripened spores. The unique pattern of spores results from the spores falling from the gill surface where they are formed.



Materials:

1 mushroom with gills, per person
1 piece of black paper per person
1 piece of white paper per person
1 bowl per person
Knife

Procedure:

1. Explain the life cycle of mushrooms to the group.

2. Distribute store-bought mushrooms and paper. Some spores are dark, and others are light. Have both black and white paper available. Use the paper that will contrast with the spore color.

3. Cut off the stem close to the cap. Place the cap, gill-side down, on a sheet of paper. If the spore color has not been predetermined, place the cap half on a white sheet and half on a black sheet.

4. Cover the mushroom cap with an inverted dish or bowl. This prevents air currents from dispersing the spores. Leave it undisturbed for several hours — overnight if possible. When the cap is lifted there will be a unique spore print. Encourage people to take the spore print home and frame it.

Going Beyond:

- Take the group on the Mushroom Adventure found in this booklet. This hike will help the group observe mushrooms outdoors in their natural setting.
- Explain that spore prints are important traits when identifying mushrooms. Distribute mushroom guides to see if the mushrooms are identifiable by their spore prints.
- To observe another one of nature's recyclers, build an Earthworm Castle, as described in this booklet.

The Lorax*

Age: 8-14 years old

Goals: To help children understand human impacts on natural systems and the environmental impacts of a consuming society.

Background:

The Lorax, a children's book by Dr. Seuss, tells of the deterioration of an environment because of reckless exploitation of "truffula trees" to produce "thneeds" to meet the incessant demands of consumers. It could very well portray our society's demands for consumer goods. We may have exploited some of our resources the same way in the United States 100 years ago. Fortunately, through individual efforts and environmentally sound legislation, many of our resources are being better managed today than the "truffula trees" were. However, our demand for consumer goods is still very high and many of our resources are still being thrown away after use instead of being recycled or reused. Our consumer demands still cause resources to be exploited in other countries that do not have the strong environmental laws that we have.

Our forests are a good example of a resource that we once exploited but now manage quite well for sustained yield. Wildlife, soil and water are also given consideration in our forest management plans. The rain forests in other countries are still being exploited, partially as a result of our demands for consumer goods.

Materials:

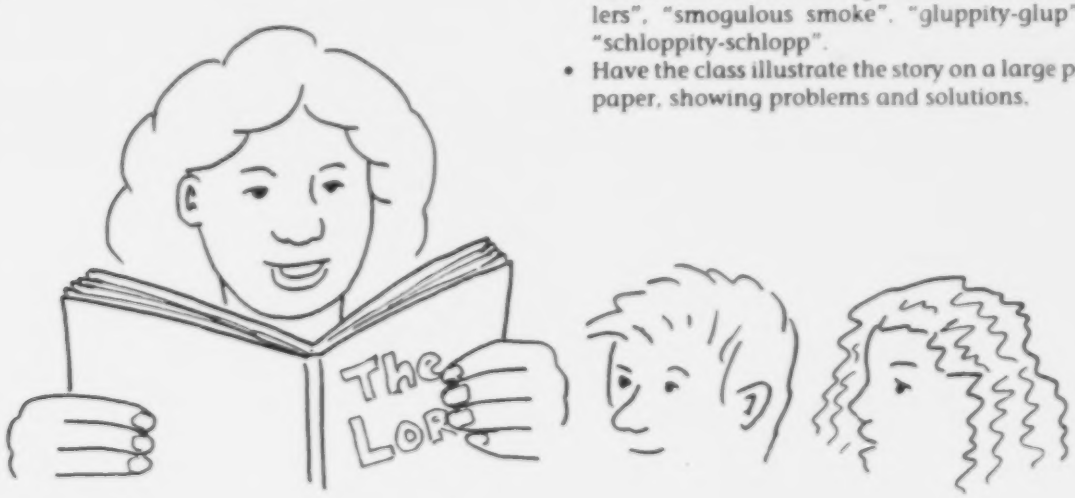
a copy of **The Lorax** by Dr. Seuss

Procedure:

1. Read **The Lorax** to your group.
2. Discuss the following questions:
   - What happened to the "truffula trees"?
   - What happened to the "brown bar-ba-loots"?
   - What was made from the "truffula trees"?
   - A "thneed" is defined as a fine thing that everyone thinks they need. What are examples of "thneeds" — things that we think we need?
   - How could the "once-lers" have made "thneeds" without destroying all of the "truffula trees"?
   - If you were the "once-ler", what would you have done differently to protect the environment?
   - What can we do today to protect the environment?
3. Make sure that the children leave with the knowledge that we must harvest resources in order to keep on living. The key is to manage and harvest our resources wisely and to get the most use out of any resource that we utilize. Reducing consumption, reusing materials and recycling resources are some of the ways that each of us can help.

Going Beyond:

- Identify real-life examples of the following items in the story: "swomee-swans", "truffula-trees", "brown-bar-ba-loots", "humming fish", "thneeds", "once-lers", "smogulous smoke", "gluppity-glup", and "schloppity-schlopp".
- Have the class illustrate the story on a large piece of paper, showing problems and solutions.



* Adapted from: **Project Learning Tree**, American Forest Council, 1250 Connecticut Ave., N.W., Washington D.C. 20036 and **AVR Teacher's Resource Guide**, Association of Vermont Recyclers, P.O. Box 1244, Montpelier, VT 05602

Dead Tree and Rotting Log Study

Age: 8-adult

Goals: To help people develop an understanding of the decomposition process and the role nature's recyclers play in recycling nutrients.

Materials:

magnifying glasses or hand lenses
clear plastic
dark plastic or heavy fabric
saw
hammer and chisel
staple gun and staples

Background:

The death and decay of a tree is a very dynamic process that provides us with one of the best teaching examples of recycling in nature. Standing dead trees and downed, rotting logs can be found in most forest communities in various stages of decomposition. They serve as excellent habitats for a variety of organisms known as decomposers or nature's recyclers. By observing and comparing these various stages of decay, you can virtually watch a tree return to the soil.

Procedure:

1. Early in the season, locate the following in close proximity to each other: small live tree, large live tree, standing dead tree, freshly fallen tree, log in initial stages of decay, log well along in decay, and punky remains of a log.

2. If possible, make a "window" in the standing dead tree by cutting out a 10 inch square section of bark at a good viewing height. Cut "windows" into the rotting logs by making two cross cuts approximately 10 inches apart and one inch deep in each log. Chisel out the section between the cuts to a depth of one half to one inch. Staple a thin sheet of clear plastic over each window, leaving a gap underneath. Punch a few air holes in the plastic. Finally, cover each window with a "shutter" made from a piece of dark plastic or heavy fabric. Staple just the top edge of the material and weight the bottom so that it will not blow around. These "windows" will enable you and your class to view nature's recyclers without continually disturbing them and destroying their homes. The "shutter" keeps the space underneath dark and more inviting to nature's recyclers.

3. Take your class on a discovery hike in search of nature's recyclers. You may want to develop a worksheet for older students to record their observations, or just arm them with magnifying glasses and guide them through the discovery process. If possible, let your students work in small groups of three to five.

4. Start with the two live trees and ask: What makes them grow? Where do they get their nutrients from? Will they live forever?

5. Next go to the standing dead tree and ask: What happened to the tree? What caused it to die? What will happen to it now? Direct your students to look for evidence of nature's recyclers at the tree. Open the "window", examine crevices (cautiously), and search the ground around the tree. Look for plants (mushrooms and lichens), birds (woodpeckers and sapsuckers), mammals (squirrels and chipmunks), amphibians (salamanders), insects (ants and termites), and other members of nature's recycling crew (millipedes, sow bugs, mites, earthworms, etc.). Ask your students what role each recycler plays in the decomposition process. Have your students close their eyes and feel the texture of the tree. Ask them for descriptive words (adjectives) about what the feel. Have them smell the tree and describe its odor.

6. Visit the freshly fallen tree and the rest of the logs in decreasing stages of decay. Ask similar questions and have your students make the same observations as they did for the standing dead tree.

7. After your students study the punky remains of a log ask: What is left from the tree/log? (minerals and some organic matter) Where did the rest of the tree go? (some back into the air and water, some into nature's recyclers) Dig up some soil nearby (first horizon) and compare the way it looks, feels and smells with the log remains. Are they similar? Review what you have found and learned.

8. Finally, go back to the small live tree and ask your students where it gets its minerals to grow. Talk about completing the cycle and how the same resources have been used over and over again.

Going Beyond:

- Discuss what happens to organic materials that we landfill. Why don't they get recycled? (no air, no sun light, limited moisture)
- Discuss what we can do to be more like nature's recyclers.
- Study nature's recyclers in the wintertime by collecting some forest floor litter and warming it with a lamp. Dormant "recyclers" will come to life under the heat from the lamp.
- Collect sow bugs, several fallen leaves and other decaying plant material. Place them in a closed container with a few drops of water. Remember to punch a few air holes in the lid. Observe the sow bugs for a few days, and then let them go.

Nutrient Recycling in Trees

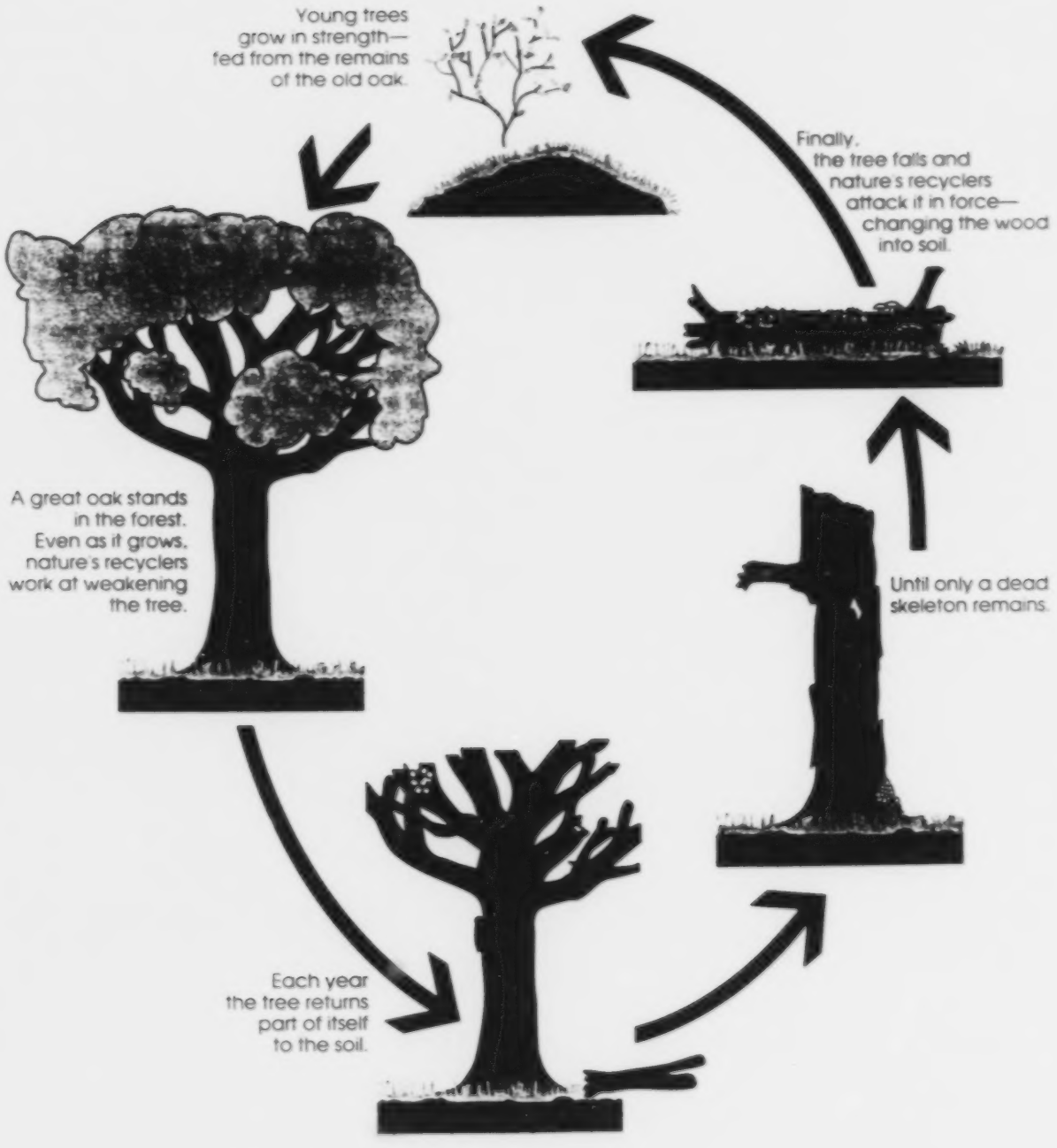

Young trees grow in strength— fed from the remains of the old oak.
Finally, the tree falls and nature's recyclers attack it in force— changing the wood into soil.
A great oak stands in the forest. Even as it grows, nature's recyclers work at weakening the tree.
Until only a dead skeleton remains.
Each year the tree returns part of itself to the soil.

Illustration by Jeanne Gomoll

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Mushroom Adventure

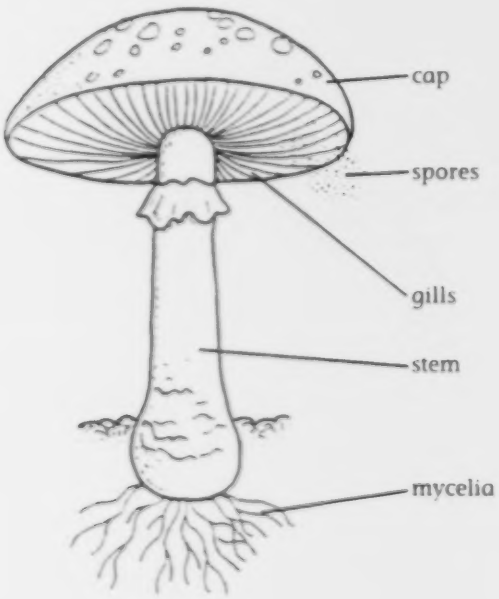
Age: 10 - adult

Goals: To teach people about mushrooms and their important role in nature's recycling system.

Background:

Mushrooms are an important part of nature's recycling team. Some mushrooms are parasites on living trees, but most mushrooms are saprophytic, using only dead materials for food. They cause decay of dead leaves, animals, and wood in the forests. Where forest soils are too acidic for bacteria to grow well, mushrooms are the main decay producers.

Mushrooms have an interesting life cycle. Tiny seed-like spores are released into the air from the fruiting body of mushrooms. When a spore lands in a fertile location, it sends out many root-like threads called hyphae. These tiny threads grow into a tangled mass called a mycelium. The mycelium is the underground part of the mushroom that chemically breaks down the material on which it eats and grows. When the mycelia are strong, and conditions are good, small mushroom "buttons" begin to form beneath the soil. The buttons take in water, swell and push up out of the soil. Gradually the mushroom's stem emerges and the cap opens like an umbrella. The cap is lined with gills that hang next to each other. Each gill contains many cells that make spores. After spores are mature, they can be dispersed by wind, water, animals and insects.



Not all mushrooms are umbrella shaped. Some grow on the side of trees like shelves. Others are globe-shaped and are called puff balls.

Prior to the hike it may be beneficial to learn the specifics about species which grow in your area. It will also help to have a mushroom identification book along on the adventure. The hike is most successful from July to September when the greatest number of species and the heaviest densities of mushrooms may be found after drenching rains.

Procedure:

1. Assemble the group. Depending on the group size, your facility, and visual aids, you may want to teach several points before going out in the field.

- Stress the importance of a detailed study of mushrooms before **anyone** attempts to gather them for food. Advise people to **look** at them, photograph them, and to **enjoy** their many colors and pleasing forms, and **forget** about eating them. Many people die each year because of mistakes in mushroom identification.
- Emphasize the lack of chlorophyll in mushrooms and the habitats of various mushrooms. Explain their extensive "root" systems, tremendous spore production and rapid growth rates under favorable conditions.
- Discuss the specific habitat requirements of mushrooms you may see on the hike.
- Stress that mushrooms are the fruiting bodies of their extensive, hidden "root" systems (mycelia) and that most mushrooms grow, ripen, disperse spores and die in just a few days. Their important roles in the nutrient cycle should also be brought out during the hike.

2. Go on the Mushroom Adventure. Look for mushrooms. Practice identifying them. Note key characteristics such as stem length and width, color, habitat, texture, spore color and gill pattern.

Going Beyond:

- Do the Spore Print activity from this booklet.
- Further study spores and molds. The spores that create mushrooms are similar to those that create molds. To see how airborne spores grow hyphae and fruiting bodies, do the following:

Place a slice of damp bread in a glass dish. Leave it uncovered for several minutes. Then cover the dish with a glass plate. Set the dish aside for several days in a warm, dark place and see if any mold grows on the food. Observe the molds with a magnifying glass. Can you see the center point from which the hyphae grow? How did the molds start at these points? The air we breath is filled with spores that produce molds and mushrooms. Like mushroom spores, mold spores can only grow when they land in favorable conditions such as the damp bread.

Earthworm Castles

Age: 5-15 years old

Goal: To help people observe and learn about one of nature's important recyclers — the earthworms.

Background:

Earthworms help make good soil. They dig tunnels that let in air and keep the soil loose. Earthworms are important recyclers because they eat bits of decayed plants and animals that are in the soil.

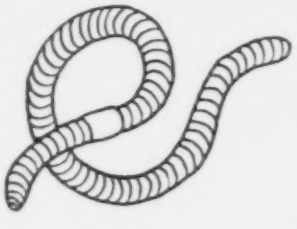
Earthworms' bodies are simple structures composed of two tubes, one within the other. The inner tube is the digestive system. The black color is the food in the digestive tract.

Earthworms belong to a group of animals having segmented bodies. Each segment is the same except for the head and the clitellum. The head, the end which moves forward, has a mouth, but no eyes. Worms do not need eyes underground. The clitellum is the swollen ring around the body. It contains many glands which secrete mucus to form the walls of a cocoon. The eggs in the cocoon are fertilized, and left to hatch in the soil. Earthworms are bisexual — each individual contains both male and female parts.

Earthworms do not have any legs. They move by extending their front half forward and anchoring it with hair-like structures called setae. Then their back half is pulled forward. Earthworms dig their tunnels by eating soil in front of them. The soil is then excreted with mucus to form the burrow walls. Castings, which are excreted wastes and dirt clumps, may be found on the surface of the ground. They look like tiny bunches of grapes. Castings have a high lime content and help fertilize the ground.

Materials: (per castle)

magnifying glass
large jar (ex. = a used mayonnaise jar)
rocks
soil
peat moss
worm food (Grass cuttings, tiny table scraps, egg shells, coffee grounds, etc.)
black paper
shovel(s) or spoon(s)



Procedure:

1. Introduce a group of children to live worms and have them watch the worms move. Using magnifying glasses, observe the setae. Locate the clitellum. Show them how to tell the front part from the rear. Put some "worm food" near the worms' mouths and see if they will eat.

2. Lead the children on a worm dig. Talk about where worms live and how they help nature cycle its nutrients. Using the spoons or shovels, have the children hunt for worms to put in the castles they will build.

3. Create the castles. Place a few rocks in the bottom of each jar. Add a mixture of soil and peat moss to a depth of about 10 cm (4 inches). Invite the worms into their new homes by carefully placing them in the jars.

4. Place some worm food on top of the soil. Foods that work well are: apple and banana peels, cantaloupe, watermelon, celery, coffee grounds, eggshells, onion peels, pizza crusts and tea bags. (To avoid fruit flies, completely cover the food with a layer of dirt.)

5. Keep the castle moist, but not wet.

6. Cover the jar with black paper. Explain that worms are sensitive to light.

7. Let them take their earthworm castles home. Have them observe the worm tunnels, the worm castings and the worm eating habits. Remind them to keep the soil moist, to keep the jar covered with the dark paper when they aren't watching the worms, and to add new "worm food" every few days. Suggest that they feed the worms table scraps. This way some of nature's recyclers are helping recycle some of the childrens' waste. Have the children return the worms to their natural habitat after they are done observing them.

Going Beyond:

- Make an "earthworm-track observation spot". Pour water over some soil outdoors to make it muddy. Come back the next day and look for worm tracks. Discuss that worms need air to breathe. They come out of the ground so they do not drown.
- Have young children pretend to be worms. Encourage them to close their eyes and move on the ground like earthworms.
- Make worm pictures by having a muddy worm crawl across a white piece of paper.
- Make an Earthworm Castle to have on display to show those people/groups who are unable to make their own castles.
- To observe another recycler, do the Mushroom Hike in this booklet.

Microbe Garden

Age: 8-17 years old

Goals: To show decomposers at work and to have people understand the role molds play in the decomposition process.

Background:

Microbes are plants and animals that help decompose materials. These molds, bacteria, yeasts, and protozoa are responsible for turning decomposing matter into nutrient pieces that are small enough for plants to absorb. Microbes are better at this task than earthworms because of the amount of materials they consume. Under favorable conditions, an earthworm eats its own weight in food daily. A microbe digests its weight in food in just a few seconds. Gram for gram there are more microbes in a compost pile than earthworms. Not only are microbes responsible for more decomposition, but they can digest many things earthworms cannot, including dead earthworms.

While microbes are small, many can be observed without a microscope. The molds that develop in mold gardens may be any color, size, or shape. The colors of molds are usually due to spores. Like airborne seeds of higher plants, spores help to propagate their species by blowing to new locations.

Some common molds that grow on bread include:

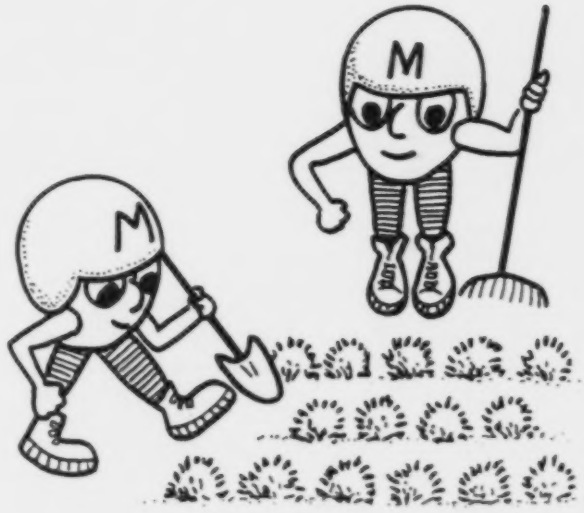
Rhizopus stolonifer (shiny black bread mold)
Aspergillus niger (fuzzy, black bread mold)
Penicillium (fuzzy, blue-green mold).

Each mold is really a colony consisting of millions of cells of one particular species. Many different molds may grow at the same time, or there may be sequential changes when some molds replace others.

Your mold garden is a model for what microbes do in well-aerated compost piles. Nature's recyclers, including the microbes, digest and oxidize garbage. The end product is good rich humus that enhances the fertility of soils.

Materials:

metal can or plastic jar (6-8" wide and 3-4" deep)
soil from garden or near shrubs
water
mold food (kitchen refuse - nut shells, potato peels, banana skins, old cereal, stale bread, apple cores, etc.) (No protein materials - meat, cheese or gelatin)
rubber band
clear plastic (cellophane)



Procedure:

1. Firmly pack about 1" of soil in the can or jar. Soil should be moist, but not water-logged.
2. Prepare 5 pieces of mold food, approximately half inch square and 1/8 to 1/4" thick.
3. Place the pieces of food on the soil, not touching one another.
4. Let the garden stand in the open air for about 15 minutes to catch spores.
5. Cover the container with plastic to prevent the garden from drying out. Use a rubber band to hold it in place.
6. Either use this microbe garden as a display, or let members of the group take it with them to observe and nurture.
7. Remove plastic for a few minutes each day to give the molds a good supply of oxygen. Add water to the soil when it dries out.

Going Beyond:

- Explain that mushrooms are the fruiting bodies of some molds. Go on a Mushroom Adventure hike as found in this booklet.
- Suggest that the group build Earthworm Castles to watch how earthworms help decompose materials.
- Make a mold garden using manufactured, less-degradable materials (cellophane, brown paper, rubber etc.) Compare the rates of decomposition between the two gardens. Record your observations.
- Explain the life cycle of a mold.

Mini-Composts*

Age: 9-17 years old

Goal: To help people learn about recycling in nature by watching nature's process at work in a miniature compost pile.

Background:

When we mention "recycling," we often think of recycling glass bottles, aluminum cans and newspapers. But another 20% of the household garbage we throw out could also be recycled. Food scraps, leaves, grass clippings and other biodegradable organic wastes can be recycled by composting. Simply stated, composting creates optimal conditions for decomposition to occur. Decomposition is the biochemical process by which bacteria, fungi and other microscopic organisms break organic "wastes" into nutrients that can be used by plants and animals. Decomposition occurs in nature whenever a leaf falls to the ground or an animal dies. It is essential for the continuation of life on earth. In order for decomposition to occur in a compost pile, several components must be present: soil, organic wastes, nitrogen, worms, water, air, time, heat and mass. Decomposition does not occur very rapidly in a landfill. Two necessary components, air and nature's recyclers, are not there. The result of decomposition in a compost pile is a nutrient-rich humus that is excellent for improving soil quality and plant growth.

Materials:

aquarium
organic wastes
soil (not potting soil)
thermometer
trowel or large spoon
1-2 dozen red earthworms

Procedure:

1. Introduce the ideas of decomposition and natural recycling. Ask the group what the verb to "compose" means. (To make. For example, musicians make songs by putting words together.) Explain that **de**compose means to take things apart. Decomposers help nature **re**cycle by breaking materials down so they can be cycled over and over again. This process can be accelerated in a compost pile. Ask: What is composting? What are the necessary ingredients for a good compost pile? How is composting related to the concept of recycling? How can composting reduce waste?

2. Assemble a variety of organic wastes in the aquarium, including leaves, needles, grass clippings, sawdust, hair, kitchen scraps, etc. Avoid meat scraps, dairy products, fats and oils which inhibit decomposition, cause odors and can attract pests. Chop wastes into small pieces. Leave some large pieces of the same materials to compare rates of decomposition between large and small items. Why might there be a difference?

3. Alternate layers of the materials as follows (amounts are approximate): one inch of soil, two inches of organic waste, a sprinkle of manure or green grass clippings and a sprinkle of water. Repeat.

4. Cover with an inch of soil. Water the pile enough to make it moist but not soggy. It should feel like a damp sponge.

5. Add earthworms.

6. Allow a school group to take the mini-compost home with them, or use it as a display piece on site. Place the compost pile where it will be at room temperature, but not in direct sun. Gently mix the compost once a week to aerate it. Use a thermometer to test the temperature of the pile. Graph the results.

7. Discuss: How composting reduces the amount of waste that is thrown out, what happens to organic wastes that end up in the landfill, whether or not the landfill is a gigantic natural compost pile, and the problems with placing large amounts of organic material in landfills.

Going Beyond:

- Suggest that everyone build a real compost pile, either as a group at school, or individually at home. For directions, write to: Education Programs, Bureau of Information and Education, Dept. of Natural Resources, P.O.Box 7921, Madison, WI 53707. Ask for the Home Composting brochure.
- Make a second compost pile with non-biodegradable materials in it. (pop can, glass bottle, comb, can opener etc.) Every week compare and contrast the rates of decay of the two boxes.
- Compare a sanitary landfill with an open dump. Half fill two clear containers with soil. Put examples of solid waste in each container. Leave the open dump uncovered and occasionally water it lightly. For the sanitary landfill, cover the waste with several inches of soil. Observe for six months. What differences are there? What types of solid waste rotted?
- Just before the ground freezes in the fall, bury identical materials outside and in containers inside. Keep the indoor container moist and warm. In the spring compare the materials. Why is temperature an important factor in decomposition?
- Try building a Compost Column using "Bottle Biology" directions. See **Resources**.
- Go on a hike to observe nature decomposing.

* Adapted with permission from: **AVR Teacher's Resource Guide**, Association of Vermont Recyclers, P.O.Box 1244, Montpelier, VT 05602

Log Tag*

Age: 5-10 years old

Goal: To give children the opportunity to use what they learned about nature's recyclers and decaying logs.

Background:

Fallen trees and rotting logs are suitable habitats for many organisms, both plants and animals. As the log or tree decomposes, it becomes a host to different plants and animals. Insects bore into a tree's protective bark, allowing air, moisture and spores of fungi to enter the tree. The fungi grow, consuming the tree's starches and dissolving the wood structure. The fruiting bodies of the fungi are food to many insect larvae, bacteria, slugs and snails.

Gradually the log is covered with mosses and grasses. Earthworms, microscopic organisms and fungi continue the decaying process underground. It takes an average of ten years for a dead tree to turn to soil. Weather, temperature and moisture as well as tree type all affect the rate of decomposition, and thus, the type of organism found. The following organisms could be described, discussed, and used in the game: raccoon, squirrel, owl, ant, beetle, earthworm, salamander, spider, chipmunk, lichen, bacterium, mushroom, butterfly, insect larva, moss, termite, microbe, millipede, and centipede.

Materials:

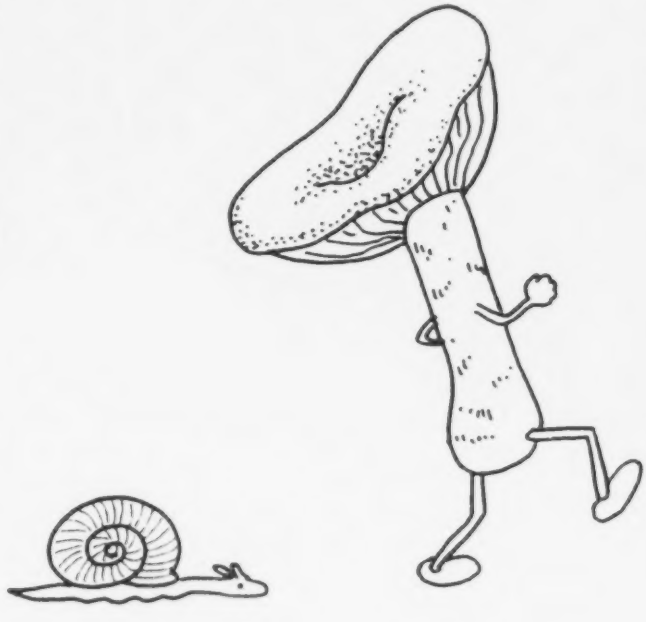
a group of people
a large open space such as a field or large campsite.

Procedure:

1. Go to an open space with the group.
2. Explain the rules to the children and choose one person to be "it". That person tries to tag other players. Other players can save themselves by crouching down before being tagged and naming a plant or animal that lives on or in a rotting log. As long as the same person is it, there can be no repeating of plant or animal names.
3. If a player is tagged before he/she can think of an animal or plant name, then that player becomes "it".
4. Whenever a new player becomes "it," all plant and animal names can be used again.

Going Beyond:

- The Mushroom Hike or Observe a Log activities are good backgrounds for this game.
- Discuss which animal and plant names the children used. Did they forget any? Which ones?



* Adapted from: **Hands-on Nature: Information and Activities for Exploring the Environment with Children**, by Jenepher Lingelbach. Vermont Institute of Natural Science, Woodstock, VT. 05091.

Tree To Turf Time Machine*

Age: 5-10 years old

Goal: To introduce the decomposition process to younger audiences.

Background:

A rotting log serves as a habitat for many plants and animals, which vary according to the log's stages of decomposition.

Materials:

4 logs in various stages of decay ranging from freshly cut to nearly soil. The logs in the later stages of decomposition can be mounted on plywood to help protect them.

Time Machine — large cardboard box painted with a seasons clock that has a movable dial; other numbers, gadgets, and dials; and closable front and back flaps.

costume for leader.

Procedure:

1. Divide the children into 3 groups: one to whistle like the wind, one to tap their fingers like the rain, and the third to chant the passing seasons "spring, summer, fall, winter."

2. As a costumed professor, explain that you have invented a remarkable time machine that will show what happens to a tree when it dies. Open the flap of the Time Machine to reveal a recently cut piece of wood, then close it.

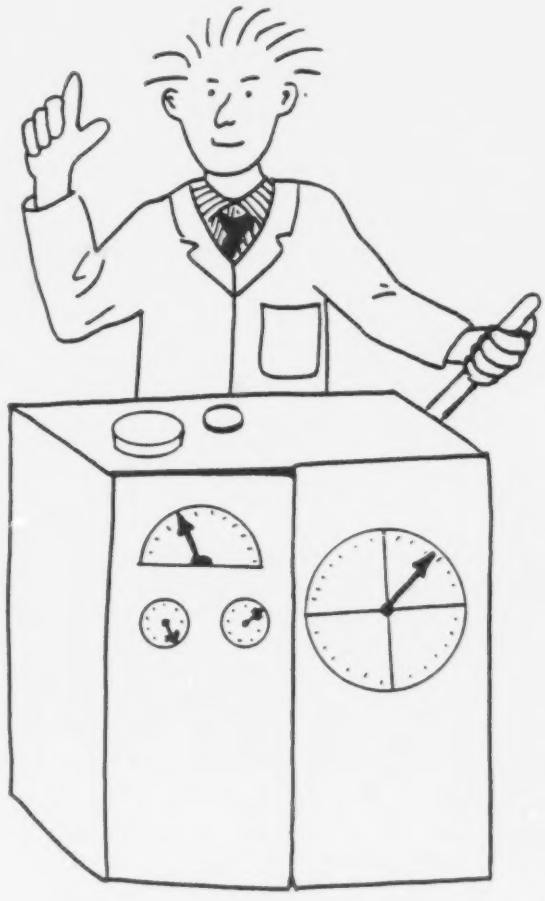
3. Progress through the first 4 years, moving the seasons dial as group 3 chants and the other groups make their sound effects. Then open the Time Machine (in which your hidden operator has switched logs) to see a log in initial stages of decay.

4. Repeat this process for the passage of 4 more years, after which the secretly replaced log will look punky and soft, and then again for the last four years (total of twelve years), when the Time Machine log will be chunks of dirt.

5. Afterwards, inspect and compare the 4 logs.

Going Beyond:

- Observe the different stages of decay outside. Talk about how different "nature's recyclers" help the tree decay at different stages. Observe the different recyclers.
- The Rotten Log Puppet Show, and Log Tag found in this booklet are related activities.



* Adapted from: **Hands On Nature**, The Vermont Institute of Natural Science. Church Hill, Road, Woodstock, VT. 05091.

Where Do Things Come From?

Age: 8-12 years old

Goals: To help children learn where our products come from and the difference between renewable and nonrenewable resources.

Background:

In order for people to understand the need for recycling, they must have an understanding of the source of the products they use and that the earth has a limited supply of resources. All of the materials that make up our goods and products are derived from the earth's natural resources. Some of our resources are quite abundant like sand and grass, but some are scarce like oil and diamonds. Some of our resources are renewable (can be replaced in a relatively short period of time) and some are nonrenewable (once taken out of the earth no more will take their place for a long, long time). For this activity all of earth's resources (excluding water and air) can be lumped into five categories—Rocks, Minerals, Petroleum/Oil, Plants, and Animals.

Materials:

copies of **Resources Scavenger Hunt Worksheet** (page 15)
clipboards
pencils
examples from each of the five resource categories listed above

Procedure:

1. Ask the children, "Where do things come from?" Discuss the earth's resources and identify the five categories. Show specific examples of products derived from each category and ask the children for other examples. Talk about renewable and nonrenewable resources. Ask the children for specific examples of each.

2. Pass out the scavenger hunt sheets, clipboards and pencils. Give them the following directions:

- Find 15 of the 30 items on the list. These should include at least three items from each of the five categories.
- Indicate items found with a check in front of the item.

Do not collect the items and bring them back!

- Identify which resource category the item belongs in by putting an **R** for rocks, **M** for mineral, **O** for oil, **P** for plant, and **A** for animal on the line behind it.
- Finally, circle the renewable resources.
- Extra points will be given for the special items listed and found. Explain that "nature's" packaging means a shell, cone or pod casing.

3. Give the children 15 minutes to hunt for items outside.

4. Call them together and go over the answers. Discuss recycling, reusing, and reducing and how these practices help conserve our resources.

Items by Category — Answers

Rocks	Minerals	Oil	Plant	Animal
glass	penny	plastic bag	charcoal	hamburger
stone wall	pop can	frisbee	bread	ice cream
pottery	diamond ring	nylon sock	lettuce	butter
cement	nail	plastic bottle	firewood	egg
stone building	pencil lead	polyester pants	paper	leather shoes

All items in plant and animal categories are renewable resources.

Resources Scavenger Hunt Worksheet

Find 15 of the 30 items listed below. These should include at least three items from each of these categories: Rocks, Minerals, Oil, Plants and Animals.

Indicate items found with a check in front of the item.

Do not try to collect the items and bring them back!

Identify which resource category the item belongs in by putting an **R** for rocks, **M** for mineral, **O** for oil, **P** for plant, and **A** for animal on the line behind it.

_ Circle the renewable resources.

- ❒ glass ___
- ❒ frisbee ___
- ❒ bread ___
- ❒ pottery ___
- ❒ butter ___
- ❒ penny ___
- ❒ egg ___
- ❒ nail ___
- ❒ hamburger ___
- ❒ ice cream ___
- ❒ pop can ___
- ❒ stone wall ___
- ❒ firewood ___
- ❒ nylon sock ___
- ❒ pencil lead ___
- ❒ lettuce ___
- ❒ cement ___
- ❒ plastic bag ___
- ❒ charcoal ___
- ❒ paper ___
- ❒ diamond ring ___
- ❒ stone building ___
- ❒ plastic bottle ___
- ❒ leather shoes ___
- ❒ polyester pants ___

Extra Credit

- ❒ returnable bottle ___
- ❒ "nature's" packaging ___
- ❒ manufactured packaging ___
- ❒ an item that can be used for something else ___
- ❒ an item made from more than one material ___

Recycling Games

Age: 10-adult

Goals: To make people more aware of our consumptive habits and the need to recycle, and to help people learn about some commonly recycled items.

Background:

These games could be good rainy day activities or time fillers.

Everything on earth, both natural and manufactured, has the potential to be recycled. However, our current knowledge, technology, facilities and economics prevent many items from being recycled. Most recycling programs are profit oriented. They tend to concentrate on "easy to recycle" and "big-$- back" materials. We must develop more markets to handle a greater diversity and a greater quantity of materials.

GLASS is made from soda ash, sand, and lime. Glass is able to hold many items that other materials cannot. However, it is heavy, breaks easily, and remains in landfills for a long time. To be recycled, it must first be sorted by color and crushed into small pieces called "cullet." The cullet is melted down into a solution and then made into glass containers again. Other products can also be made from recycled glass bottles such as insulation, and road-patching material.

ALUMINUM is made from bauxite, which is a non-renewable resource. Aluminum is light weight, and corrosion resistent. When recycled, it is melted and then shaped again into new cans and other items. For every aluminum can recycled, 95% of the energy needed to create a new can is saved.

TIN-PLATED STEEL cans are made of iron ore and tin, neither of which are renewable resources. The cans will eventually rust and break down. However, throwing them away is a waste of valuable metals. When recycled, the cans are put into a huge container with holes in the bottom. This container is immersed into a caustic solution which takes the tin off the cans. Then the steel cans are washed and sold as Number 1 Grade Steel. The tin is removed from the caustic solution by electrolysis and made into ingots which are sold to companies requiring tin.

PAPER is made from a renewable resource — trees. Paper is shredded into small pieces and mixed with water. This mixture is beaten into a mush-like pulp which flows onto a moving screen through which most of the water passes. The wood or paper fibers remain. The fibers are pressed through heavy rollers that remove more water and then are sent through steam-heated dryers.

PLASTICS are made from petroleum, coal, air, water, and industrial organic chemicals. By varying the type of chemicals added to plastic resins, the finished product may be flexible or rigid; transparent, opaque, or colored; or easy to tear or rigid. While plastics are convenient and useful, they contain many toxins which can pollute our land, water and air. Throw-away plastic packages also constitute much of our litter. Plastics of similar type are melted down and molded into new products. Because of US FDA regulations, plastic is not recycled into food containers.

Materials:

copies of **Recycling Games Worksheet** (page 17)
pencils for each person.

Procedure:

1. Distribute copies of the games. Instruct the group to complete the matching games and break the code for the coded recyclables. Tell them the coded words are a list of 10 recyclable materials. In this code, one letter is substituted for another. The object of the game is to decipher the 10 recyclables. Get them started by giving them the first answer, "newspaper".

2. If you wish, divide the group into teams.

3. Check their answers. Discuss each answer and its implications.

Number Match: 1-g, 2-c, 3-j, 4-e, 5-a, 6-i, 7-b, 8-f, 9-h, 10-d.

Word Match: 1-h, 2-e, 3-a, 4-i, 5-c, 6-d, 7-f, 8-b, 9-j, 10-k, 11-g.

Coded Recyclables: 1. Newspaper, 2. Glass, 3. Motor Oil, 4. Tires, 5. Aluminum Cans, 6. Cardboard, 7. Asphalt, 8. Metal, 9. Leaves, 10. Cars

4. Let the winners do something special, such as getting to be first in line on a hike or not having to help clean up after an activity.

Going Beyond:

- Use these word games as a pre-program activity to find out what members of your group already know about recycling. Use the background information to let people know where materials come from and how they are recycled. Have examples of the different materials to show the group. Stress how important it is to imitate nature by giving new life to materials that are decay resistant or in short supply.
- Invite the group to share their recycling adventures. Ask what they do at home, at school, at work. What can they recycle in their community?
- Further research the cycles of natural resources.
- Do other related activities from this booklet — Musical Instruments, Make Your Own Paper, Fire Place Logs From Newspapers, Sing Along, and Where Do Things Come From?

Recycling Games Work Sheet

Recycling Number Match

1. Number of buyers of recyclable materials in Wisconsin.	___	a. 1000
2. Percent of all paper that is recycled in U.S.	___	b. 350
3. Percent of all paper recycled by Japan.	___	c. 26
4. Number of metal cans used each year by a family of five.	___	d. 12
5. Number of glass jars and bottles used each year by a family of five.	___	e. 2000
6. Pounds of solid waste thrown away by a family of five in a year.	___	f. 17
7. Number of plastic containers used by a five person family in a year.	___	g. 600
8. Number of trees it takes to make a ton of paper.	___	h. 400
9. Gallons of oil saved by recycling a ton of paper.	___	i. 4000
10. The energy saved by recycling an aluminum can could keep a light bulb on for this many hours.	___	j. 50

Recycling Word Match

1. Recyclable, ground-up glass	___	a. Paper
2. Changes organic materials into usable nutrients	___	b. Motor Oil
3. Half of all land-filled waste	___	c. Cellulose insulation
4. A use for shredded newspapers	___	d. Aluminum
5. A use for finely ground newspapers	___	e. Composting
6. Recycling _____ saves 95% of the energy to process it	___	f. Plastics
7. Made from petroleum and natural gas; recycling is still in infancy	___	g. Natural Resources
8. Wisconsin law requires communities to set up collection centers for this	___	h. Cullet
9. Our largest portion of household waste	___	i. Animal bedding
10. If materials aren't recycled, they go here	___	j. Newspaper
11. If materials aren't recycled, they use up	___	k. Landfills

Coded Recyclables

1. Z B E V N J N B P
2. O W J V V
3. I D A D P D T W
4. A T P B V
5. J W Y I T Z Y I L J Z V
6. L J P F R D J P F
7. J V N C J W A
8. I B A J W
9. W B J S B V
10. L J P V

Crafts from Trash

Age: 5-12 years old

Goals: To help children learn that many items can have more than one use, and that the longer you keep an item out of the waste stream, the better it is for the environment.

Background:

Many containers can have their "lives" and usefulness extended by finding creative ways to reuse them. In this activity, children will learn to make toys, musical instruments, piggy banks and bird feeders from common household trash.

Recycle for the Birds

Materials:

clean household containers:
- milk, detergent and bleach bottles
- milk cartons
- coffee cans
- pie tins
- onion sacks

mustard jar lid (for tracing circles)
sticks or dowels (for perches)
knife
hammer
nails
wire cutters
pencils
ruler
light wire
coat hangers

Procedure:

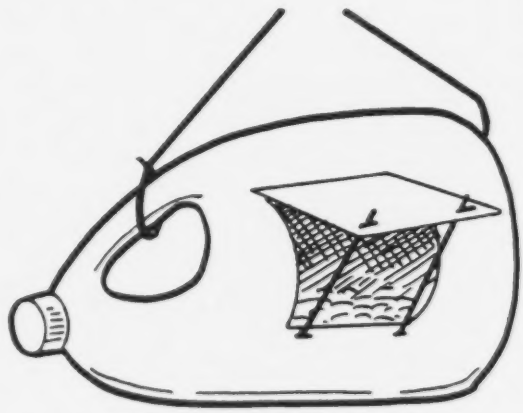
1. Create bird feeders out of clean household containers using the drawings for models. Assist younger children with the cutting. Remember to punch small drain holes in the bottom of the containers to let rain water out.

2. Discuss the proper locations for installing the feeders with your group and the types of bird feed to put in each container. Inform them of their responsibility for maintaining a continuous supply of food once feeding is started and the importance of keeping the feeders clean.

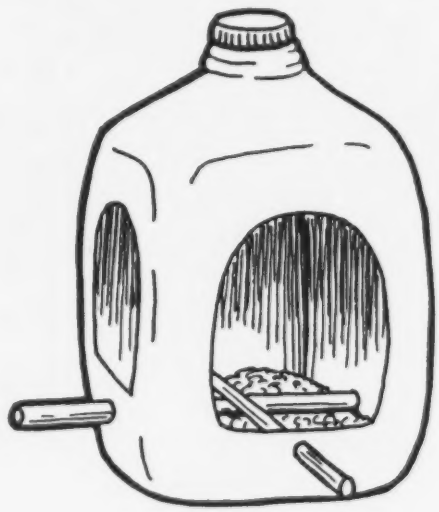
3. Discuss the importance of reusing materials and develop a list of common items that can be reused and the new uses for each.

Going Beyond:

- Design and create bird houses out of natural or manufactured containers.
- Provide string, old yarn, baler twine, cloth strips, etc. for nesting materials. Wind these through an onion sack and hang the sack on a coat hanger.
- Donate feeders to nursing homes and maintain them.



Bleach bottle feeder



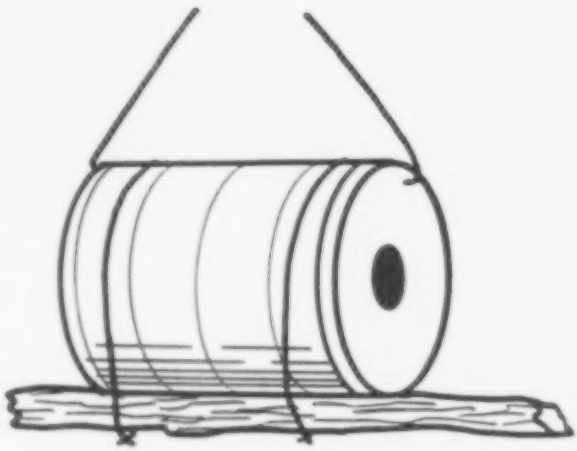
Milk jug feeder

Detergent bottle feeder

Pie plate feeder

Onion sack suet feeder

Milk carton feeder



Coffee can feeder

Plastic Bottle Pig Bank*

Materials:

plastic bleach bottle
4 corks per bottle
1 pipe cleaner
construction paper
glue
scissors
red marker

Procedure:

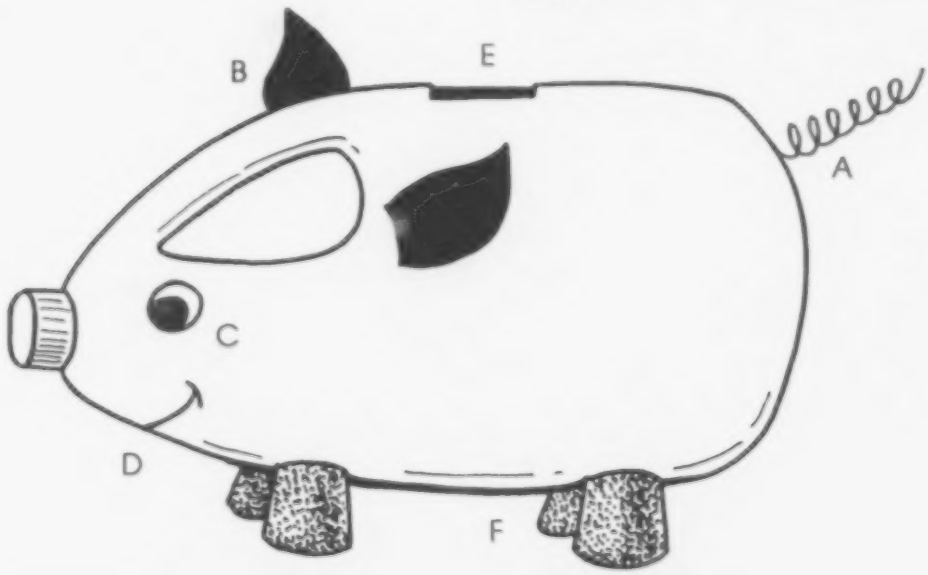
1. Encourage children to bring plastic bottles and corks with them. These could be their "entrance tickets" to your craft room. Save plastic bottles yourself for the occasional "I forgot my bottle"ers. Friends Groups could also be asked to save plastic bottles.

2. Guide your class through the process of "pig construction" using demonstrations and the following directions:

- Rinse bottle out thoroughly.
- Make the pig's tail by twisting a pipe cleaner around a pencil and then slide it off.
- Lay bottle on its side with handle facing up and with neck of the bottle representing the pig's snout. With tip of scissors poke a hole for pipe cleaner "tail" at the base. Stick pipe cleaner "tail" into the hole and affix with glue. (See "A" on drawing). Younger children will need help puncturing and cutting the bottles.
- Draw two ears on the construction paper and cut them out. Glue them on each side of the bottle. (See "B" on drawing).
- Draw and cut out two eyes and glue them on each side of the bottle just above the snout. (See "C" on drawing).
- With red marker, draw a mouth below the snout. (See "D" on drawing).
- Cut out a slot, large enough to fit a fifty cent piece in, on top of the bottle between the ears. (See "E" on drawing).
- Glue four corks on the bottom of the bottle for legs. (See "F" on drawing).

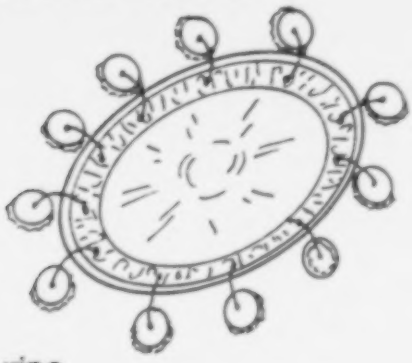
Going Beyond:

- Point out to the children that they just took a piece of trash and made it into a treasure. Ask them to think of other objects that can be reused in ways different from their original purpose. Ask them how they are helping the environment by reusing items.



* Adapted from: **Everything Goes Somewhere**, a Recycling Study Guide. University of WI-Ext. (1989), UW Stevens Point.

Musical Instruments*



Tambourine

Materials:

pie tin
bottle caps
string or yarn in 3" pieces

Procedure:

1. Punch holes around pie tin with hammer and nail.
2. Punch one hole in each bottle cap.
3. Put a string through one hole in pie tin and one bottle cap and tie a knot in each end of the string.
4. Continue stringing each hole with a bottle cap.

Bottle Xylophone

Materials:

8 used glass bottles of uniform size
water
wooden and metal spoons

Procedure:

1. Put bottles in a line without touching each other.
2. Leave the first bottle empty.
3. Put a small amount of water in the 2nd.
4. Put more water in each bottle until the last one is full.
5. Hit each bottle with a wooden spoon and listen to the tones. Try using a metal spoon and hear the difference.

Milk Carton Shaker

Materials:

gallon plastic milk carton with top
dried beans or sand
crayons

Procedure:

1. Design the outside of the container with crayons.
2. Put dried beans or sand in bottom of container (only small amount needed)
3. Screw on lid.

Going Beyond:

- Use these instruments with the Sing Along found in this booklet.
- Discuss how the instruments were made from items that normally would have been trash.
- Use your imagination to think of other instruments that can be made from trash.

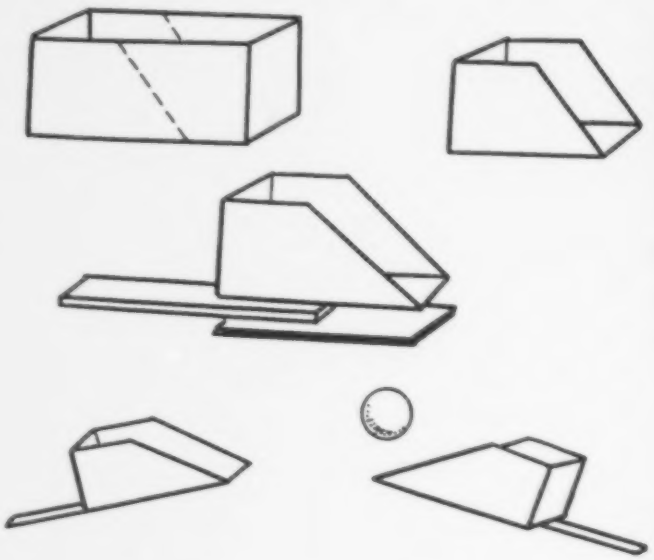
* Adapted from: **Project Pride,** Quality Forward. P.O. Box 22. Asheville, NC 28802

Recycled Toys

Scoop Ball

Materials: (per set of Scoop Balls)

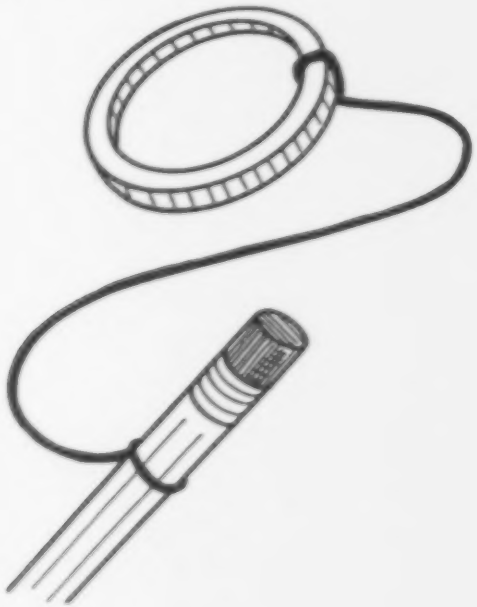
2 shoe boxes
glue
2 thin strips of wood (approx. 7" x 1") (used paint stirring sticks work well)
2 cardboard strips
ball (tennis, whiffle or racquet ball would work, or be resourceful and use a ball of used tin foil)



Procedure:

1. Children should be told in advance to bring a shoe box and plastic or cardboard lid with them.
2. Cut two shoe boxes into scoops as shown in the diagram.
3. Glue a thin strip of wood to each scoop for a handle.
4. Reinforce the handle by gluing an extra piece of cardboard to the bottom of each scoop.
5. Allow the glue to dry.
6. Play ball! Players stand opposite one another and toss the ball back and forth with their scoops. No hands can touch the ball. Pairs can compete against other pairs by seeing who can make the most consecutive catches.

Ring Catch



Materials:

1 pencil per person
1 lid from an ice cream, margarine, or sherbet container
scissors
string

Procedure:

1. Cut out the center of the lid.
2. Tie the string from the lid to the pencil.
3. Swing the pencil back and forth and try to catch the ring on it.

Going Beyond:

- Discuss with the children how they just turned a piece of trash into a fun toy! What else could they make with their trash? Discuss how using the lids over again saves our landfill space. It also saves natural resources by not having to use virgin materials to build new toys.
- Bring in a commercial set of scoop balls. Discuss the difference in price, the difference in materials (degradable versus non-degradable), and the similarity of performance for the two styles of scoops.

Make Your Own Paper

Age: 5-12 years old

Goals: To show children that used paper can be recycled into new paper.

Background:

What happens to used paper? Most paper is thrown away in landfills or is burned. If we recycle paper we save landfill space and utilize valuable wood fibers over again.

Making your own paper from old paper is similar to what happens in a paper recycling mill. At a mill the pulp is put into a machine with a long moving screen. The water drips through the screen. Then the screen moves through parts of the machine that press and dry the pulp. The final product is new paper.

The paper you make will be much thicker and rougher than recycled paper made in a mill. Paper mills have many kinds of machines to make the paper smooth and flat.

If time is limited, most of the pulp can be prepared the night before. If you make it much in advance it should be refrigerated to prevent fermentation.

To make special occasion paper, add colored threads or dried flowers and leaves to the completed pulp.

Materials:

a blender or egg beater and bowl
a flat dish or pan, a little larger than the screen
a round jar or rolling pin
per child:
- 10 pieces of tissue or newsprint
- a piece of non-rusting screen
- 4 pieces of blotting paper or felt the size of the screen

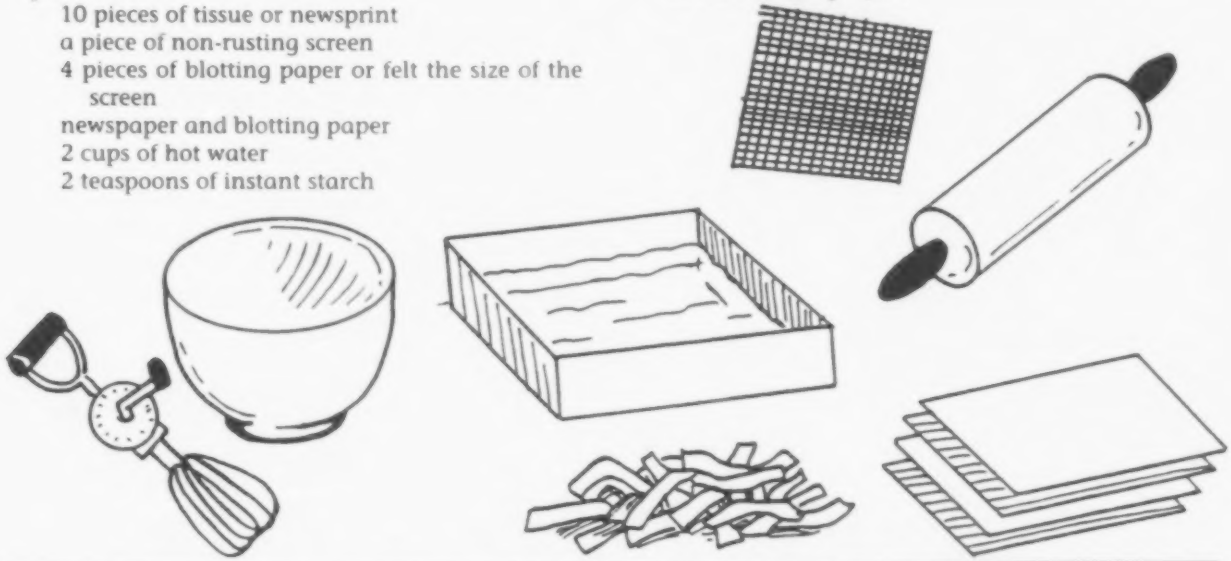
newspaper and blotting paper
2 cups of hot water
2 teaspoons of instant starch

Procedure:

1. Tear the newspaper into very small bits. Add 2 cups of hot water to 1/2 cup of shredded paper.
2. Beat the paper and water in the blender, or with the egg beater, to make pulp. Mix in the starch. Completed pulp should be the consistency of split pea soup.
3. Pour the pulp into the flat pan.
4. Slide the screen into the bottom of the pan and move it around until it is evenly covered with pulp.
5. Lift the screen out carefully. Hold it level and let it drain for a minute.
6. Put the screen, pulp-side up, on a blotter on some newspaper. Put another blotter over the pulp, and more newspaper over that.
7. Roll a jar or rolling pin over the "sandwich" to squeeze out the rest of the water.
8. Take off the top newspaper. Turn the blotter sandwich over. Then take off the blotter and the screen very carefully. Do not move the pulp. Voila! There is your paper!
9. Put a dry blotter on the pulp and let the paper dry for 24 hours.

Going Beyond:

- Ask the children to speculate how much paper they use in one day (napkins, lunch bags, school work, paper cups, newspaper, etc.) What would life be like without all of these products?
- Encourage the children to use the paper they made in another art project.



Natural Dyes*

Age: 5-10 years old

Goal: To show children that natural products can be substituted for manufactured products.

Background:

Many of the products that we purchase are colored or printed with manufactured dyes and inks. Some of these dyes and inks have a petroleum base and quite a few of the brighter colors are derived from heavy metals like cadmium and lead. These elements move through food chains and accumulate in the tissues of higher organisms. Even trace amounts may impair body functions or cause death. Extraction of these harmful elements is difficult, and the remaining residues are toxic and persistent in our environment. As we become more concerned about our impact on the environment, we will be looking at natural dyes and inks for coloring and printing.

Materials:

chilled, hard-boiled eggs
containers for heating, storing and dyeing
dyes as indicated below:

Dye Base	Colors Produced
Walnut shells	Buff or adobe
Red cabbage leaves	Robin blue
Orange peels	Light yellow
Carrot tops	Smokey yellow/green
Fresh cranberries	Dark green
Onion skins	Orange
Spinach	Light gold

Procedure:

1. Prepare dyes ahead of time by placing a small amount of the items mentioned above in individual pans and add two cups of cold water. Place over heat and bring rapidly to a boil, simmer for 10 minutes, turn off heat, cover and steep for 30 minutes. Remove residues, place in containers and refrigerate.

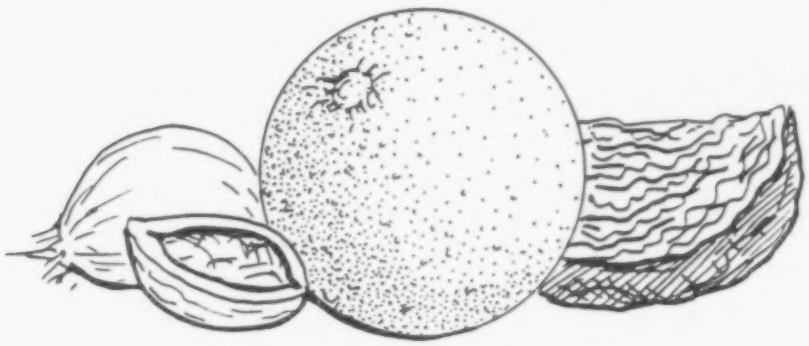
2. Discuss with your class where colors come from. Ask them if they know of any "sources" for colors. Discuss how things were colored in the past and what we might have used for inks. Explain to older students that many of our colors today are derived from heavy metals and the impact these metals have on the environment.

3. Show children the dyes that you made and their source materials. Ask them if they have any other ideas for natural dyes.

4. Assemble dyes, eggs, and containers (recycled, of course) and have children select dyes for coloring their eggs. Coloring time varies with dyes and the intensity of color desired. Leaving the eggs in the dyes in a refrigerator overnight will give the deepest colors. Remove from dye and dry on metal cake racks. Refrigerate eggs as soon as possible. Refrigerated hard-boiled eggs can be kept for a week.

Going Beyond:

- Have children experiment with making other natural dyes.
- Use dyes for water coloring.
- Use dyes for tinting while making paper from recycled paper.



* Adapted from: **Recycle Alaska Activity Handbook**, State of Alaska, Department of Environmental Conservation, Pouch O, Juneau, Alaska 99811

Fireplace Logs from Newspapers*

Age: 8-adult

Goal: To help people learn that energy can be recovered from trash.

Background:

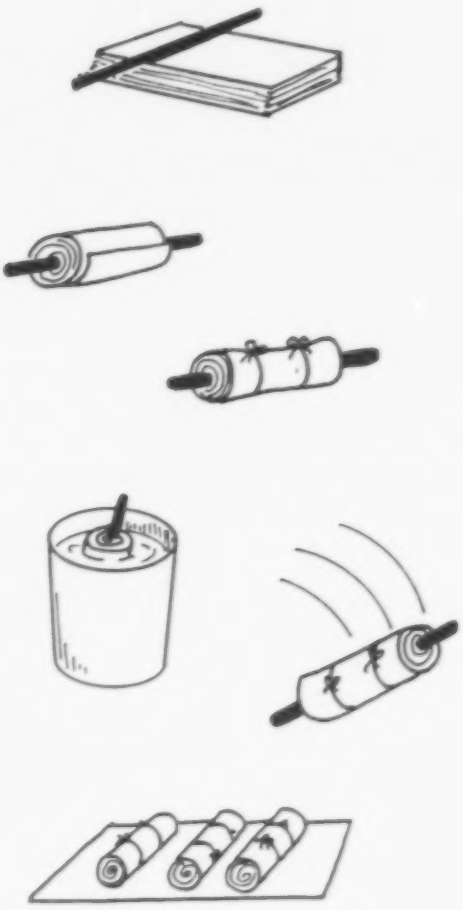
Reducing consumption, reusing materials, recycling resources, composting food and yard wastes, recovering energy through incineration and landfilling are the alternatives that we have for handling our trash. Incineration may be as controversial as landfilling, but when done as part of an energy recovery system with good environmental controls, it is a viable alternative. In Wisconsin we annually landfill enough energy in our trash to heat 300,000 homes; this is a tremendous waste of resources. Many communities are now looking at waste-to-energy plants as a sound way to help solve their trash problems. They are doing it as a fifth step after reducing, reusing, recycling and composting. If there is not a market for newspaper in your area, turn your newspaper into fireplace logs for energy.

Materials:

container(s) large enough to hold several soaking newspaper logs
newspapers
used twine or string
broomsticks
scissors
water

Procedure:

1. Take eight pages of newspaper and lay them unfolded on a table or floor lengthwise. Lay the broomstick at the top of the paper.
2. Tightly roll the newspaper around the broomstick to about 8 inches from the end. Overlap another 8 pages and continue rolling until you have a good size log.
3. Tie 3 inches from each end with used string or twine.
4. Soak overnight in water. The water will break down the papers' fibers and reduce the amount of fly ash when the logs are burned.
5. Take logs out of the water and bang them on the ground to pack the paper.
6. Remove the broomstick and dry thoroughly (on racks if possible).



Going Beyond:

- Discuss where the energy that is stored in the newspaper comes from.
- Sell logs as a fund raiser.
- Use old continuous fold computer paper instead of newspaper.

* Adapted from **Recycle Alaska Activities Handbook**, State of Alaska, Department of Environmental Conservation, Pouch O, Juneau, Alaska 99811

Sing Along

Age: All Ages

Goal: To have these catchy tunes stick in peoples' minds so that they will think about recycling in everyday life.

Background:

Singing songs related to the theme of your activity or hike is a great way to wrap up a session. Hand out music sheets so people can sing along with you. Encourage children to play the recycled musical instruments they can create in the craft section.

"Dr. Recycle"

(Sing to the tune of the "Dr. Pepper Song".)

I'm a successful recycler and I'm proud —
I used to be alone in a crowd —
But if you look around these days,
There seems to be a "Recycling Craze"!

Chorus
Oh — You can reuse, she can reuse,
he can reuse, I can reuse —
Recycling is really up to you!

Repeat chorus.

Be a cycler — Be a recycler!
(Repeat this line six times getting softer each time.)

"Five Little Bottles"

(Sing with hand movements.)

5 little bottles sitting in a row,
1 was recycled, then there were 4.
4 little bottles sitting in a row,
1 was recycled, then there were 3.
3 little bottles ...
2 little bottles ...
1 little bottle sitting in a row,
it was recycled and then there were none to be thrown away.

"The Recycling Song"*

(Sing to the tune of "A Yellow Submarine".)

Chorus:
We all live in a world that could be clean
a world that could be green
a world that could be clean.

If our friends down at the store
used less styrofoam,
recycled more,
cans of blue, and red and green,
all would vanish in a crunching machine.

(Sing Chorus)

If our trash cans all had names
mixing cans with paper is a shame,
we could sort
the glass and then
all our trash would be used again.

(Sing Chorus)

* Adapted from **Recycle For Reuse**, by The Wisconsin Extension Service.

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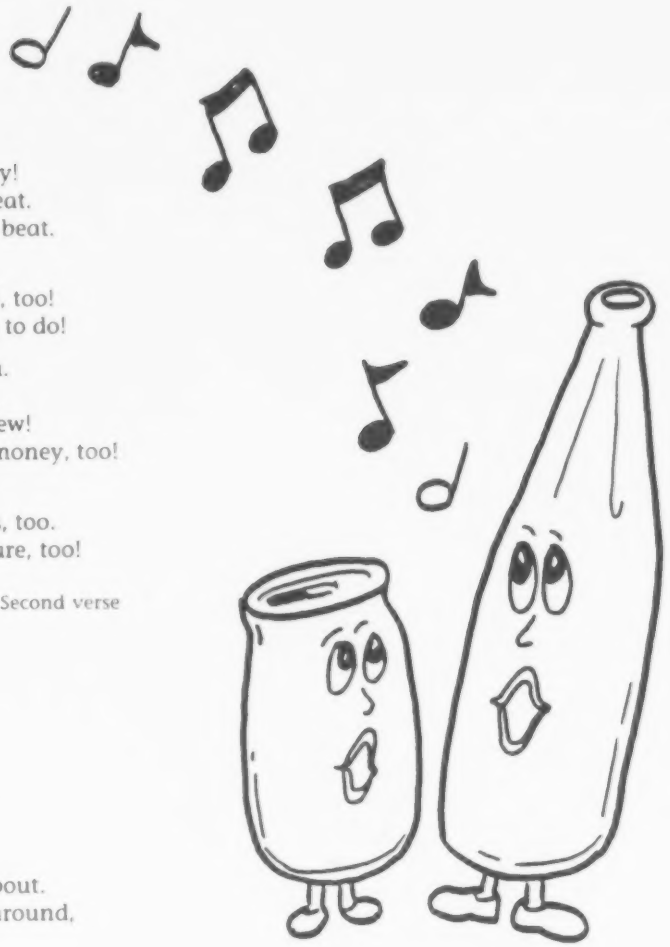

"Recycling is the Way"

(Sing to the tune of "Jingle Bells".)

Recycling is the way...to handle trash today.
No more giant landfills here... there is a better way!
Just separate your trash — at your home oh, so neat.
'Cuz curbside pickup is a treat. Recycling can't be beat.

Chorus:
Save your glass, save your paper, save your metal, too!
Show your neighbors that you care. It is the thing to do!

Disposable just won't do. Carry your cup with you.
Styrofoam's not smart. And costs you money, too.
Disposable just won't do. Diapers of plastic — whew!
Babies love diapers made of cloth. And they save money, too!

Chorus:
Reuse your cups. Reuse your plates. Reuse utensils, too.
When you toss your plastic out, you toss your future, too!

First verse written by Mary Snudden, Eau Claire Schools. Second verse written by Rosemary Thielke, Milwaukee, WI.

"Cleaning Up All the Litter"*

(Sing to the tune of "Hokey Pokey".)

Put your litter bag in. Take your litter bag out.
Put your litter bag in and then you shake it all about.
You clean up all the litter and you turn yourself around,
That's what its all about!

Put your paper in. Take your paper out.
Put you paper in and you shake it all about.
You clean up all the litter and you turn yourself around.
That's what it's all about!

Procedure:

Sing and act out the song using litter. Every child will need 1 litter bag, and 4 pieces of litter, similar to the other children's (can, a piece of paper, milk carton, straw, etc.)

- Ask the group to form a circle, children facing one another.
- Start with the 4 pieces of litter on the floor at everyone's feet and the litter bags in everyone's hands.
- Sing "Clean Up All the Litter" and perform appropriate motions. The children will have fun singing and dancing while becoming aware of litter.
- Proceed with the other litter pieces.
- Repeat the original verse and you're finished.

* Adapted from: **Project Pride**, Quality Forward. P.O. Box 22, Asheville, N.C. 28802.

Rotting Logs Puppet Show

Age: 5-12 years old

Goal: To show children that many of nature's recyclers utilize dead, decaying logs.

Background:

Rotting logs are homes for many animals. As logs rot, different animals inhabit each stage of decay. Raccoons, squirrels, owls and woodpeckers like trees that are in the beginning stages of decomposition. They use the big holes as homes. Spiders like decomposing logs during the intermediate stages of decomposition because many other bugs are there to capture and eat. Earthworms, slugs, and snails like trees in the final stages of decay when the trees are changing to soil. The new forming ground is moist, loose and rich in nutrients.

The following puppet show/play can either be done with puppets, or with actors. The actors/puppeteers can be park staff, volunteers, or children. Create puppets with paper lunch bags and construction paper or old socks and yarn scraps. Because of the reading involved, it is recommended that older children play the parts.

Materials:

a real or constructed rotting log
3 pieces of paper with "Directions", taped to a stick
4 costumes or 4 puppets (bear, spider, raccoon and a worm)

Procedure:

1. Either choose 4 children to be actors/puppeteers or have staff people participate. Encourage the actors to really act out the role of their animals. For example, the worm should wiggle on the ground, and the spider should walk daintily. Tell everyone else it is their job to be a good audience.
2. Perform the Rotting Logs Show.

Rotting Logs Show*

Characters: Rocky Raccoon
Benji Bear
Charlotte Spider
Wendy Worm

Rocky: Benji Bear, I've been looking for you. As king of the forest you must have a list of all the individual homes around here.

Benji: I sure do. Are you in need of a home, Rocky Raccoon?

Rocky: Yes, I am. Nothing too fancy, no moss to moss carpeting or anything, just a fairly dry place with a roomy hole for me to stay in.

Benji: I know just the home for you Rocky. It has a soft, comfortable floor and thick, well-insulated walls. I'm sure you'll find it a perfect, snug home for the winter. Just follow these simple directions and you'll have no trouble finding it.

(Hands him a piece of paper)

Rocky: Thanks a lot, Benji.

(Walks off: Charlotte Spider appears)

Charlotte: Hey, Benji, I'm in need of a home too. Do you have anything for me?

Benji: What kind of place are you looking for, Charlotte Spider?

Charlotte: The older the better, with a lot of little cracks and crevices for me to crawl under and through. I need a safe place for my sac of eggs and a spot where I will be protected and warm enough to spend the winter.

* Reprinted with permission from: **Hands-On Nature**, The Vermont Institute of Natural Science, Church Hill Rd, Woodstock, VT. 05091

Benji: I've got the perfect place for you, Charlotte. This home will help protect you from predators and will be a great place for you to find food. These directions will show you how to get there.

(hands her same paper and Charlotte walks off; Wendy Worm appears)

Wendy: Oh Benji, can you help me? I'm having a terrible time finding a home.

Benji: Sure, Wendy Worm. What kind of home do you want?

Wendy: "Us" worms go for damp soil. It offers all the comforts and conveniences of ground life. I'd like a soft place with lots of rotting things so I can find good food.

Benji: Well, it just so happens I know of a place with nice, rich, damp soil. Here are the direction to get there.

(hands her same paper)

Wendy: Thank you, Benji. I knew I could count on you.

(log comes up: Rocky and Wendy each approach it from opposite sides)

Rocky: This rotting log over here must be my new home.

Wendy: Your home! Benji Bear told me it would be my new home.

Charlotte: *(creeping up over the log)* Hey, you guys, quit the joking. This is my new home.

Rocky and Wendy: **Your** Home!

Rocky: We can't all live in the same place. I'm a raccoon and I need solid walls and nice dry leaves.

Charlotte: I'm a spider, and I like small spaces to hide in and places to catch my food.

Wendy: And I'm a worm. I'm a prisoner inside solid walls, and dry leaves are rough on my skin. I like dirt, myself, where I can move around easily.

Charlotte: I don't know. What do you think, audience? Could we all use the same rotting log for our homes?

(wait for answer)

Rocky: There's a nice big hollow space at this end for me.

Charlotte: The middle of the log has great places for me to crawl around in and plenty of juicy insects to eat.

Wendy: Well, I can live over at this end where the rotting wood has almost turned to soil.

Rocky: So, I guess we all can live together. *(yawns)* I better go test my new bed. *(leaves)*

Charlotte: This rotting log provides a nice home for each of us. I think I'll hide behind here and wait for dinner. *(leaves)*

Wendy: So it doesn't matter that I'm a worm, and he's a raccoon and she's a spider. Life in this log is good for all of us. I better go burrow in that damp soil; this dry air is too much for me. Bye-bye everyone. *(leaves)*

Going Beyond:

- Play Log Tag, go on a Mushroom Adventure, build an Earthworm Castle, or study a Dead and Rotting Log. (All activities found in this book.)

Exhibits

Many simple exhibits can be created to give examples of natural and human recycling. Here are a few ideas:

Cycles — Make posters or bulletin board displays showing natural cycles like water, nutrient, CO_2/O_2, and rock cycle or human recycling showing paper, aluminum, plastic, etc.

Nature's Recyclers — Make posters or bulletin board display showing nature's recyclers and the roles that they play.

Nature's Litter — Make a poster or display that shows nature's litter on the forest floor and the various stages of its decomposition. This could be done as part of a soil profile.

Packaging — Gather examples of the following packages for a "hands on" table:

Natural — acorn, cones, milkweed pods, egg shell, orange peel, coconut

Old — returnable bottle, pottery, birch bark container, paper egg carton, basket

New — plastic bags and bottles, aluminum can, bimetal can, "blister pack", polystyrene egg carton

Deadly Litter — Create a display or collage using plastic 6-pack holders, balloons, fishing line, aluminum flip or tab tops, polystyrene particles, nylon netting, broken glass, open cans and appropriate magazine pictures or photographs showing their deadly impact on wildlife.

Renewable/Nonrenewable Resources — Collect and display the following examples:
cereal box—paper—pulp—wood—tree—soil—earth
pop bottle—glass—sand—rock—earth
Al can—sheet Al—Al ingot—AlO_2—bauxite—earth
plastic bottle—melted plastic—oil—earth
apple—tree—soil—earth

Natural Reuse — Collect and display examples of natural objects being reused in nature such as: grass, leaves, mud and hair for nesting material, shells for invertebrate homes, etc. Show human reuses too — reed chairs, grass mats, etc.

Composting — Set up a compost bin (or examples of several types of bins) and use it! Create a display comparing leaf litter decomposition with composting.

Community Recycling — Find out what is recyclable in your community and set up a display showing recyclable items and their preparation for recycling.

Your Daily Waste — Assemble examples of an individual's daily and weekly accumulation of trash. Use photos for monthly and yearly trash.

Why Waste? — Set up a display using pictures, products, and narrative information to explain the magnitude of the resources that we use and dispose of each year.

Hazardous Household Products — Set up a display of these products and environmentally safe alternatives.

Environmentally Safe Shopping — Set up a display or pictures showing shopping alternatives to our disposable/throw-away society (i.e., buying in bulk, buying returnable bottles, etc.)

Resourceful vs Wasteful Picnic — Set up a display that compares a picnic using a picnic basket with its reusable plates, cups, utensils, napkins and food containers with a picnic using all disposable plates, cups, utensils, napkins and food containers. Show the amount of trash that each one generates.

Glossary

Bauxite: The principle source of aluminum, containing alumina and impurities.

Biodegradables: Materials that will decay over a short period of time. They can be broken down by microorganisms into simple, stable compounds such as carbon dioxide and water.

Chlorophyll: A green material in leaves and in other green parts of plants that is used to carry on photosynthesis.

Composting: Mixing food scraps, grass clippings, and leaves in an optimal environment for decomposition to form a rich soil conditioner.

Cycle: To circle, occur again, over and over.

Decay: The destruction or decomposition of organic matter as a result of bacterial or fungal action.

Decompose: To break down into basic elements; to rot.

Decomposer: A plant or animal that feeds on dead material and causes it to break down. Examples include fungi, earthworms, and bacteria. These are nature's recyclers.

Dump: An open and unmanaged disposal site used prior to sanitary landfills.

Fungi: (singular = fungus) Simple plants that cannot use the sun's energy to make food because they do not have chlorophyll.

Habitat: The area where an animal or plant lives and finds nutrients, water, shelter, and living space.

Incinerator: A facility designed to reduce waste volume by burning. It can be equipped to generate energy.

Ingots: A mass of metal shaped for convenience in storage or transportation.

Leaf litter: Slightly decayed leaves lying on the forest floor.

Lichen: A plant composed of fungi and algae living together in a partnership.

Litter: Waste material discarded in an inappropriate place. Littering is illegal in Wisconsin.

Microbe: Very small plants and animals that aid in decomposition.

Mold: A type of fungus that grows on decaying materials.

Natural resources: Valuable, naturally occurring materials such as soil, wood, air, water or minerals.

Non-biodegradables: Materials that will not decay and cannot be recycled.

Non-recyclables: Items which are made of materials that cannot be recycled.

Nonrenewable resource: A natural resource that is considered finite in amount because of its scarcity, the great length of time it takes to form, or its rapid depletion (e.g., coal, copper, petroleum).

Nutrients: A substance with nutritive value that is necessary for growth.

Photosynthesis: The process by which green plants use the sun to change carbon dioxide and water into sugar.

Recyclables: Items made of materials which can be reused either in the same form or as part of a different product.

Recycle: To collect and reprocess manufactured materials for reuse either in the same form or as part of a different product.

Reduce: To lessen in extent, amount, number or other quantity.

Renewable resource: A natural resource derived from an endless or cyclical source. With proper management and wise use, replacement of these resources by natural or human assisted systems can be approximately equal to their consumption.

Reuse: To extend the life of an item by using it again, repairing it, modifying it, or creating new uses for it.

Sanitary landfill: A specially engineered site for the disposing of solid waste on land.

Trash: Materials considered worthless, unnecessary, or offensive that are usually thrown away.

Virgin material: Any basic material for industrial processes which has not previously been used (e.g., wood/pulp trees, iron ore, silica, crude oil, bauxite.)

Yard waste: Organic wastes generated in the yard including leaves, grass clippings, sticks, etc.

Resources

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K-3 Supplement

to the Recycling Study Guide

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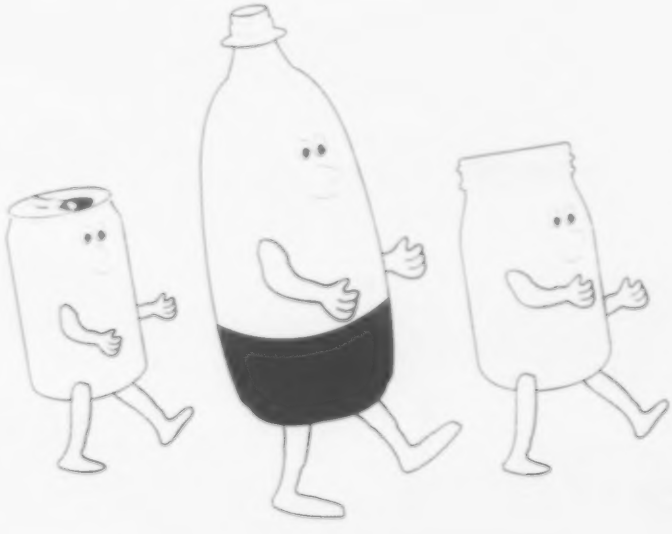
Introduction

Recycling... Recycling... Recycling. With Wisconsin's new recycling law, everyone is talking about recycling as a way to solve our growing trash problem. However, just *talking* about recycling, and talking just about *recycling*, will not produce the changes needed in our society to address the trash problem. We need to develop a citizenry that is informed, educated, and willing to act. Besides teaching people how to and why they should recycle, we also need to encourage them to reduce consumption and reuse materials. We have already begun. In 1987 the Wisconsin Department of Natural Resources produced the very popular **Recycling Study Guide** to help educators teach recycling, reducing, reusing, and composting to youth. It is designed for grades 4-12.

This booklet is intended to be a supplement to the **Recycling Study Guide** for grades K-3. It includes activities, worksheets, and take-home materials for younger students. It does not repeat the background information, glossary, and resource listing found in the original guide. Please refer to the **Recycling Study Guide** for that information.



It's Your Trash

Goals:

To help students become aware that everybody contributes to the solid waste problem and that we should work together to solve the problem.

To introduce the practices of reducing, reusing, and recycling as a means to help reduce the amount of trash we generate.

Background:

Much of what ends up in our trash was once considered valuable, necessary, or desirable by us because of what was wrapped in it. Once discarded, it loses its value and becomes part of a messy, dirty problem called trash. There are many kinds of trash and many different ways to help alleviate our trash problem. Since we all generate trash, all of us need to do our part to help solve the problem.

Materials:

- small magnet
- four boxes or grocery bags labeled: *Reduce, Reuse, Recycle, & Trash*

Procedure:

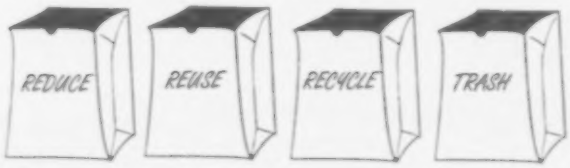
1. On the day before this lesson is taught, ask your students to help their parents make supper that night. Have them save all the containers that food came in. Bring those containers to school tomorrow. Send a note (like the one at the bottomof this page) home with each student to request parental assistance. Also, before you start this activity, find out what items can be recycled in your community.

2. At the start of class, have each child bring his/her empty food packages to the front of the room and put them in a pile on the floor. Ask students to explain what they had for supper and how the food was packaged.

3. Ask your class what they usually do with all of this packaging. They probably will say, "Throw it away."

4. Ask your students what they might call this pile of stuff. Write a definition of trash on the blackboard. Trash: things we throw away because we don't want them anymore.

5. Ask them what this pile of stuff would be called if it was scattered all over the playground. Write a definition of litter on the blackboard. Litter: trash that's been thrown on the floor or ground.



Parent Letter

Dear Parent,

Tomorrow we will be learning about recycling in class, and we need some examples of food packaging. Please ask your child to help you make supper tonight and save all of the packaging or containers that your food came in. Assist him/her with opening, emptying, rinsing, and drying them. Send them to school with him/her tomorrow. Thank you for your help.

Sincerely,

6. Have two or three volunteers sort the trash into several piles of similar items. Ask these questions:

- What are these things made of? (glass, paper, plastic, metal, etc.)
- Are all of the cans the same? Using the magnet, give several students the opportunity to sort the magnetic metal (steel) from the aluminum.
- Were these items trash when you first bought them?
- Why did you buy them?
- What makes them trash now?
- What do you think about trash? Or, What words can you use to describe trash? Write these on the blackboard.

7. Then ask them:

- Whose trash is this?
- What should we do with it? Put it in your desk? Keep it in this room? Why not?
- Where should we put it?
- Whose job is it to take care of trash?
- Do we make too much trash?

8. For older students, write "Throw Away" on the black board. Ask: Where is "away"? What happens to trash?

9. Place four boxes or shopping bags labeled *Reduce, Reuse, Recycle* and *Throw Away* next to the trash.

- Discuss with your class what each of these terms means.
- Ask students to help you sort out items that can be recycled and reused.
- Discuss how each can be recycled and reused as you place it in the appropriate container.

10. Next, ask them how the amount of trash that's left can be reduced. (Buy food in bulk so there won't be as much packaging, buy food in containers that can be recycled or reused, etc.) Put items that could have been reduced in the *Reduce* container.

11. Put what is left in the *Trash* container. Ask the class:

- Is it better for the environment to reduce, reuse, and recycle? Why?
- What can you do to reduce, reuse, and recycle at home?

12. Finish the activity by appropriately taking care of the recyclables and the "trash".

Going Beyond:

- Copy and give your students the **Recycling Maze** worksheet found on page 9. Ask them to follow the path from their house to the recycling center, collecting all six recyclable items along the way.
- Encourage your students to recycle at home. Find out what is recyclable in your community and how to sort and prepare those items for recycling. Contact your local Departments of Public Works or Solid Waste Management, or call recyclers listed in the Yellow Pages for this information. Copy and give your students the **Recycle—It's Easy** take-home instructions for recycling found on pages 13-14. Ask them what is recyclable in their community. With your knowledge and their input, direct them to check the "yes" or "no" box for recyclability in their community under the directions for each item. Go over the simple directions for each recyclable item. Send **Recycle—It's Easy** home with them, and encourage them to help their families recycle.
- Copy and give your students the **Trash It Or Recycle It** worksheet found on page 10. Ask them to draw a line from each item to the proper container it should be placed in.
- Set up a "Reuse Box" in the classroom for paper that has been used on only one side. Encourage students to use it.
- Collect aluminum cans, plastic soda, milk and detergent bottles, and other items that can be recycled in your community. Take them to a recycling center and use the money to support your school recycling project or to take an environmental field trip.
- Ask the custodian not to empty the waste basket for several days (do not put food wastes in basket). What are your students' reactions? Discuss these with the class.

Where Do Things Come From?

Goal:

To help students learn what things are made of and where they come from.

Background:

All of the materials that make up our goods and products are derived from the limited supply of earth's natural resources. Flax and cotton come from plants; paper and wood come from trees; grains come from plants; aluminum, iron and tin are made from metallic compounds dug out of the earth; glass is made from sand, soda and lime; and most plastics and polyester fabrics are made from petroleum. Once children learn and appreciate where things come from, they can better understand the need for conserving our natural resources.

Materials:

- piece of cotton and a scrap of cotton cloth
- small tree branch, a piece of paper, and a pencil
- ear of corn and box of corn flakes
- motor oil, plastic bottle, and polyester cloth
- scrap of iron and "tin" can
- sand and glass bottle

Procedure:

1. Collect and assemble the items listed above.
2. Show your students the cotton cloth and ask: What is this made of? Where did it come from? Show them the piece of cotton and tell them the cloth was made from cotton fibers. Pull apart the cotton to show the fibers. Stretch and twist the fibers to show how thread is made. Pass this around. Ask: Where does cotton come from? Cotton comes from a plant that is cultivated in warmer climates.
3. Repeat this procedure for the other items.
4. Select different items found in your classroom and ask the same questions. First select items that come from one resource and then pick items that come from two or more resources.

Going Beyond:

- Copy and distribute the **Where Do Things Come From?** worksheet (page 11). Have your students draw a line from each item to where it came from.
- Collect and display materials in different stages of manufacturing process for a variety of products. For example: tree branch—wood shavings—wood pulp—paper; iron ore—iron ingot—flat iron—knife; corn plant—ear of corn—kernel of corn—pop corn.
- Trace the origin of items we use highlighting the retail and manufacturing processes. For example: Cotton shirt—department store—shirt factory—cloth factory (where thread is woven into cloth and dyed)—cotton processing plant (where cotton is cleaned, carded, and spun into thread)—farm (where cotton is grown and picked)—soil, air, & sun (where the cotton plant gets its nutrients and energy to grow).

Clay Bottle Recycling

Goals:

To teach students that our natural resources are limited and can be conserved by recycling.

Background:

Our earth has a limited supply of natural resources, and once we use them up there will be no more. Many of the products we make with these resources can be recycled or reused—saving energy and allowing us to use resources over again. For example, beverage containers are made from a variety of resources and the process of making them uses a great deal of energy. Recycling saves these materials and requires less energy. Some glass bottles can be returned for a deposit to be cleaned and used again. Most glass bottles can be melted down and

made into new bottles. Aluminum cans can be melted down and formed into new aluminum products. Since most plastics have low melting temperatures and recycled plastic may contain contaminants, plastic bottles are not made into new beverage containers. They are shredded into fibers and used as fiberfill in jackets or in making rugs. They can also be melted and formed into new plastic products.

Materials:

- clay—enough for each student to make two or three "bottles"
- examples of bottles (glass & plastic) and cans that can be recycled
- fiber filling from an old jacket

Procedure:

1. Show your students the pile of clay. Ask them to pretend this is all of the clay there is in the world. Once they use it up, there will be no more. Tell them they will make bottles with the clay and will pretend to drink soda from the bottles. Then the bottles will be thrown away.

2. Give each student a small piece of clay and ask him/her to make a bottle and to pretend to drink from it.

3. Collect their bottles and pretend to throw them away. Ask them if they want more pretend soda. Repeat this procedure until all of the clay is gone.

4. Ask:
   - Where did all of the clay go?
   - Where did all of the clay bottles go?
   - How are we going to get more soda if there is no more clay to make bottles, and there is nothing else to make bottles with?
   - What could we have done to make the clay last longer?

5. Retrieve the clay bottles that have been "thrown away". Give one to each student and make the rest of the bottles into a pile of clay again. Tell them we are going to start over and to pretend they have not thrown their first bottles away. Ask them: What can we do with these bottles so that the clay will last longer?

6. Discuss the term recycle, which means using the same materials to make new products.

7. Tell your students they are going to recycle their bottles. Collect the bottles and mix them all together again. Give each student a piece of this clay and have him/her make a new bottle. Tell them this is recycling. They made new bottles from used bottles and did not have to use any clay from the pile you previously put aside. Many materials can be recycled over and over again. Show them examples of bottles and cans that can be recycled. Ask: Why is recycling important? It conserves our natural resources (the clay pile).

8. You may want to tell your students that some materials can be recycled into new things that look different from what they originally were. Have them make a clay cup out of their clay bottle. Show them a plastic soda bottle and some fiber filling that may have been made from a plastic soda bottle.

9. Tell your students that some bottles can also be returned for a deposit. Discuss how they can be washed, sanitized, and refilled as many as 20 times before they wear out. Have them make new bottles and use these to demonstrate this.

Going Beyond:

- Copy and pass out the **Follow That Bottle** worksheet (page 12). Tell your students that glass bottles are made from sand and other materials we dig out of the ground. These are mixed together at very high temperature in a glass factory and made into bottles. Bottles are then sent to the bottling plant where they are filled with soda. Have your students trace (with red crayons) the path the bottle takes from the glass factory, to the bottling plant, to the store, to their house, and finally to the landfill. If the bottle is recycled, it does not go to the landfill. It goes back to the glass factory and is made into a new bottle. Have your students trace (with green crayons) the path the bottle takes from their house, to the glass factory, to the bottling plant, to the store, and finally to their house.
- Ask students to bring examples of recyclable items to class. Use these for "show & tell".
- Read **The Lorax** by Dr. Seuss. Discuss how the "truffula" trees could have been saved by recycling "thneeds".
- Collect a new leaf, some soil, and dead leaves in several stages of breakdown. Discuss how nature recycles nutrients.

Making a Model Landfill*

Goals:

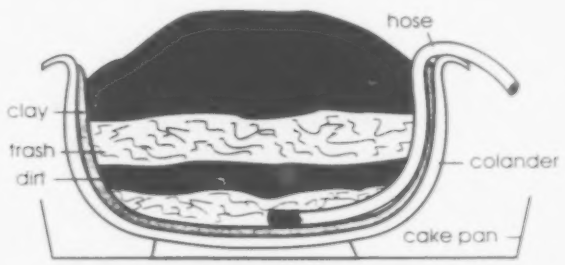
To teach students where their garbage goes and to help them understand the problems associated with garbage disposal.

Grades: 2-3

Background:

Every day, each person in Wisconsin throws away approximately 3.5 pounds of trash. Most people give little thought as to where it goes and what happens to it when it gets there. Where is "away"? In the United States, "away" means a landfill, incinerator, or even the ocean! In Wisconsin, "away" is usually one of the over 200 licensed landfills located throughout the state. Wisconsin use to have over 1,000 dumps and landfills. However, only a small percentage of these were state-of-the-art landfills, designed to prevent pollution problems. With new federal regulations, most of the older dumps and landfills were closed, and Wisconsin residents had fewer places to put their trash. Most people do not know what happens to their trash when it's put in a landfill. Thus, they question the need to close old landfills and resist the construction of new landfills in their community.

This activity will help students understand what happens to their trash. The students will become familiar with the term "leachate"—the liquid that has percolated through trash or been generated by the decomposition of trash in a landfill. It carries dissolved or suspended materials that may contain toxic chemicals which can contaminate ground and surface water. Leachate is one of the major problems associated with landfills.



Materials:

- 2 plastic colanders
- 2 cake pans
- 1 half gallon ice cream bucket of garden soil per colander
- 3 feet of plastic aquarium hose
- 1 rubber band
- small piece of nylon stocking
- small pieces of typical home-generated garbage (see Parent Letter)
- modeling clay
- grass seed
- colored crepe paper
- paper & pencil

Procedure:

1. The day before you teach this lesson, ask your students to bring in five items their family throws away. Send a note (like the one at the end of this lesson plan) home with each student to remind her/him and to request parental assistance.

2. After doing "It's Your Trash" or a similar activity, ask your students the following questions:
   - What happens to your trash after you throw it away?
   - Where is "away"?
   - Has anyone been to any of these "away places"?

Give them ample opportunity to share their ideas and experiences.

3. Tell students that most of the trash in Wisconsin ends up in landfills. Ask them: What happens to trash once it is buried in a landfill? After you discuss some of their answers, ask them to help you build two model landfills. One will be an old fashioned dump, and one will be a modern sanitary landfill.

4. Line one colander with flattened modeling clay. Pat out clay into a thin layer, like a pie crust. This represents the liner of a sanitary landfill. Do not line the second colander. It represents the old fashioned dump where the policy was to dig a hole, dump in the trash, and cover it with dirt.

5. Attach the piece of nylon stocking to one end of the plastic aquarium hose with a rubber band. Put this end in the bottom of the clay lined landfill. This will be your monitoring well. The leachate that collects at the bottom of the clay liner can be siphoned off and examined.

6. Have students cut each different garbage item into small pieces, about two inches square. You will have to cut or break metal, glass, or leather items.

*Developed by Mary Snudden, Eau Claire School District, Wisconsin

7. Place trash and soil in colanders in alternate layers until they are filled. Keep a list of all items placed in each landfill or keep an example of each piece of trash. You may want to add a layer of colored crepe paper to represent toxic waste (the color leaches out).

8. Build a small mound of dirt in each colander and plant grass seed. Let your students add "match box" garbage trucks, front end loaders, graders, and compactors that might be used at a landfill site. Place cake pans under the colanders to collect the seepage or leachate.

9. Have your students water or "rain" on each landfill twice weekly and observe the changes that are taking place. Pay particular attention to the seepage or leachate accumulation in each cake pan. The seepage from the unlined landfill can be observed as it collects in the bottom of the pan. This observable phenomenon helps children understand how ground water can be contaminated. The lined landfill should not have any seepage. Where did the "rain" water go in this landfill? To find out, you will have to siphon leachate out of the bottom of the clay liner using the "monitoring well". Gently suck on the protruding end of the aquarium hose while keeping this end below the bottom of the clay liner. As the leachate is drawn up the hose and starts down towards your mouth, stop sucking and stick this end of the hose in the cake pan or a glass jar. This should draw off all of the leachate. Observe the leachate and discuss what you have found. Did any "toxics" show up? In modern landfills, leachates are collected and properly disposed of to prevent groundwater contamination.

10. After a period of time (several months*), open each landfill and see how many items you can find and identify. What changes have taken place? What would have happened to the leachate if it was not siphoned off or trapped in the pan?

*Note: Several months may seem like a long time for young children to wait. Put the "opening" date on each landfill and do weekly observations as a "count down" to the "opening"—make it a big event.

Going Beyond:

- Place a small sample of each item landfilled in a jar of water. Have your students observe how water changes or doesn't change things and how things change water.
- Once a landfill is full and officially closed, a clay "cap" is put over it to keep water out. This also effectively seals out air. What will happen to the trash if no water or air can get into the landfill? You may want to add a third colander-landfill with a clay cap to your experiment and observe what changes may take place.
- Put examples of items made from materials used 100 years ago (wood, leather, glass, iron, etc.) and items made from modern materials (plastic, styrofoam, aluminum, etc.) in separate jars of water. Observe what happens over time. What happens to plastics that are dumped in the ocean?
- Fill a glass jar two thirds full of water. Add four drops of red food coloring. Put a stalk of celery into the water. Observe what happens. Do plants filter pollutants out of water?

Parent Letter:

Dear Parent,

Tomorrow we will begin learning about landfills in class, and we need examples of items that families throw away. I have asked each child to bring in five small examples of household trash. Please help your child collect items from the following list:

- all types of paper items
- all types of plastic or "styrofoam"
- vegetable matter (potato peelings, carrot chunks, grass clippings, etc.)
- animal matter (chicken wing bones—only a small amount)
- broken small toys—"match box" car pieces (metal, tires, windshields, etc.)
- aluminum foil
- other—use your imagination

Put the items in a small plastic bag and send them to school with her/him tomorrow. Thank you for your help.

Sincerely,

Big Bag—Small Bags

Goal:

To help students learn to reduce waste by buying products in large packages instead of single serving packages.

Materials:

- large bag of potato chips
- same quantity of potato chips in single serving packages
- two trays

Procedure:

1. Buy a large bag of potato chips and the same quantity of chips in single serving packages. Note what each costs.

2. In class, place the large bag on one side of a table and the small bags (including all of their packaging) on the other. Ask your students: Which side of the table has the most potato chips?

3. Next, empty the contents of the large bag onto one tray and the contents of the small bags onto another. Place their respective packaging in two separate piles. Ask: Which tray has the most chips? Which pile has the most packaging?

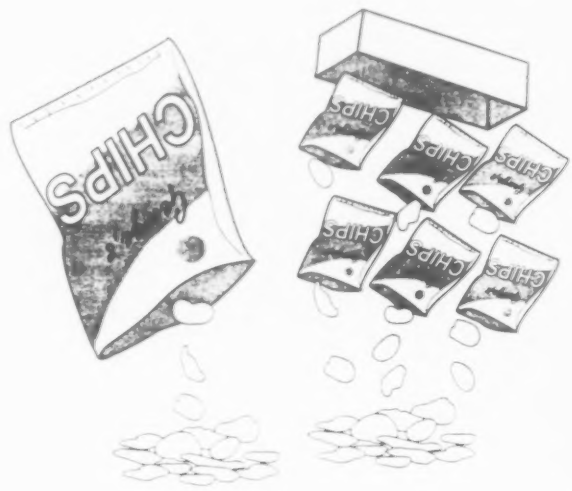
4. Tell your students what you paid for each package of chips and what the chips cost per ounce for each tray of chips.

5. Lead a discussion on packaging based on your potato chip example. Talk about the merits of buying in bulk versus single serving packages. Ask your students how they can bring chips to school if their parents buy chips in big bags only.

6. Finally, divide up the chips and eat them!

Going Beyond:

- Bring in other examples of bulk versus single serving packages. Discuss the advantages and disadvantages of each.
- Encourage your students to investigate ways they can reduce waste, reuse things, and recycle at home. Copy and pass out the **Home Recycling Survey** found on pages 15-16. Ask your students to take these home and do the survey with their parents.



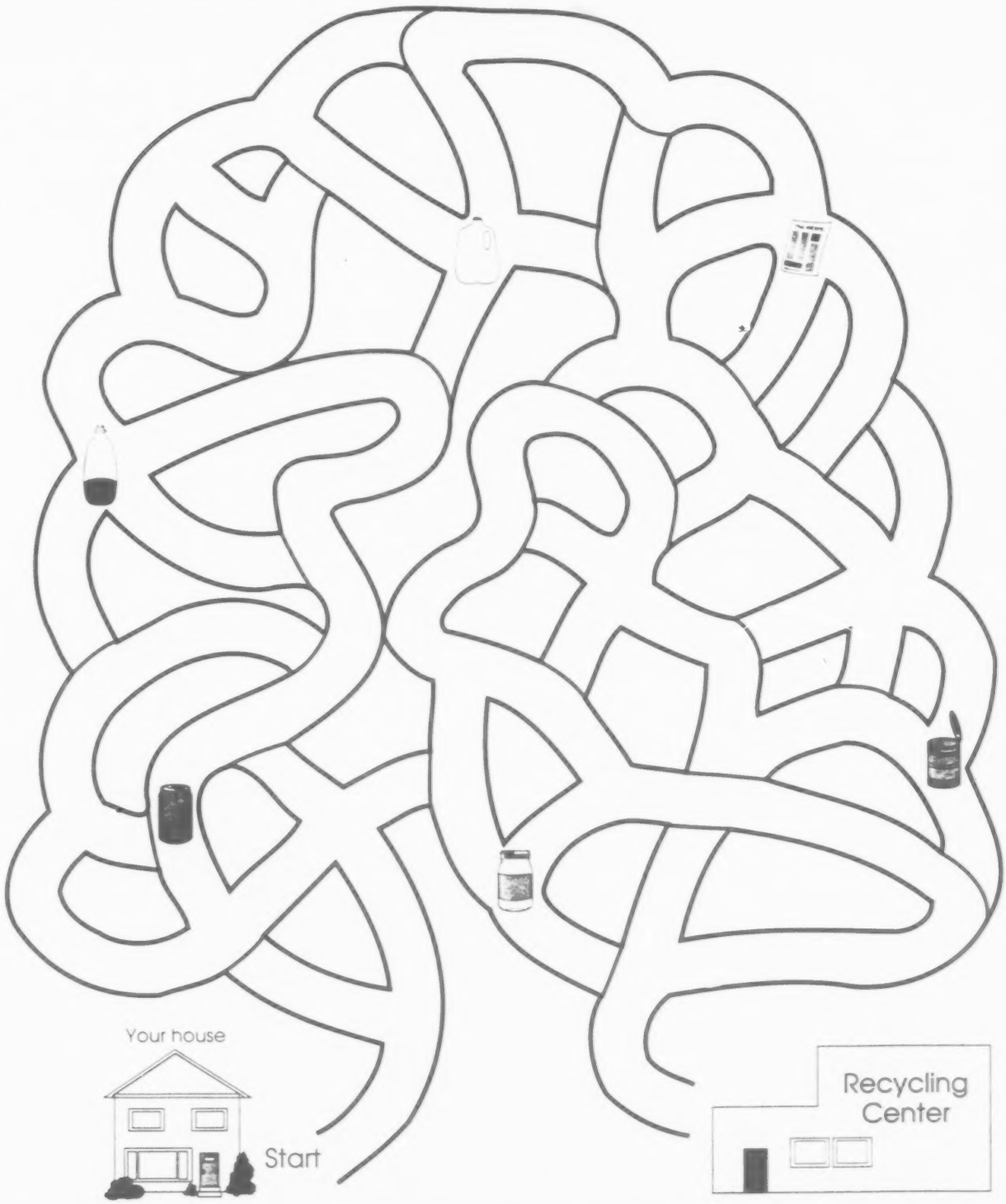
Jay's Potato Chips*

Package	Total Wt.	Wt. of Chips	Pkg. Wt.	Cost/oz.
1- 6.5 oz. bag	7.04 oz.	6.5 oz.	.54 oz.	$ .23
12-.05 oz. pkgs.	10.56 oz.	6.0 oz.	4.56 oz.	$ .35

*Priced on November 18,1990, at Woodman's Food Store in Madison, WI.

Recycling Maze

With a pencil or crayon, follow the path from your house to the recycling center. Collect all six recyclables along the way. Do not cross any lines.

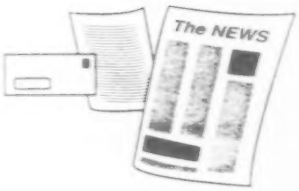


Trash It Or Recycle It

Draw a line from each item to the barrel it should go in.

Where Do Things Come From?

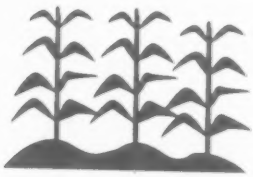
Draw a line from the item to where it came from.



oil

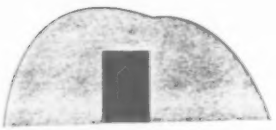
trees

sand



corn field

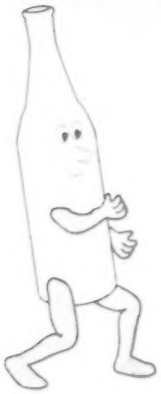
cotten bush



tin mine

aluminum mine

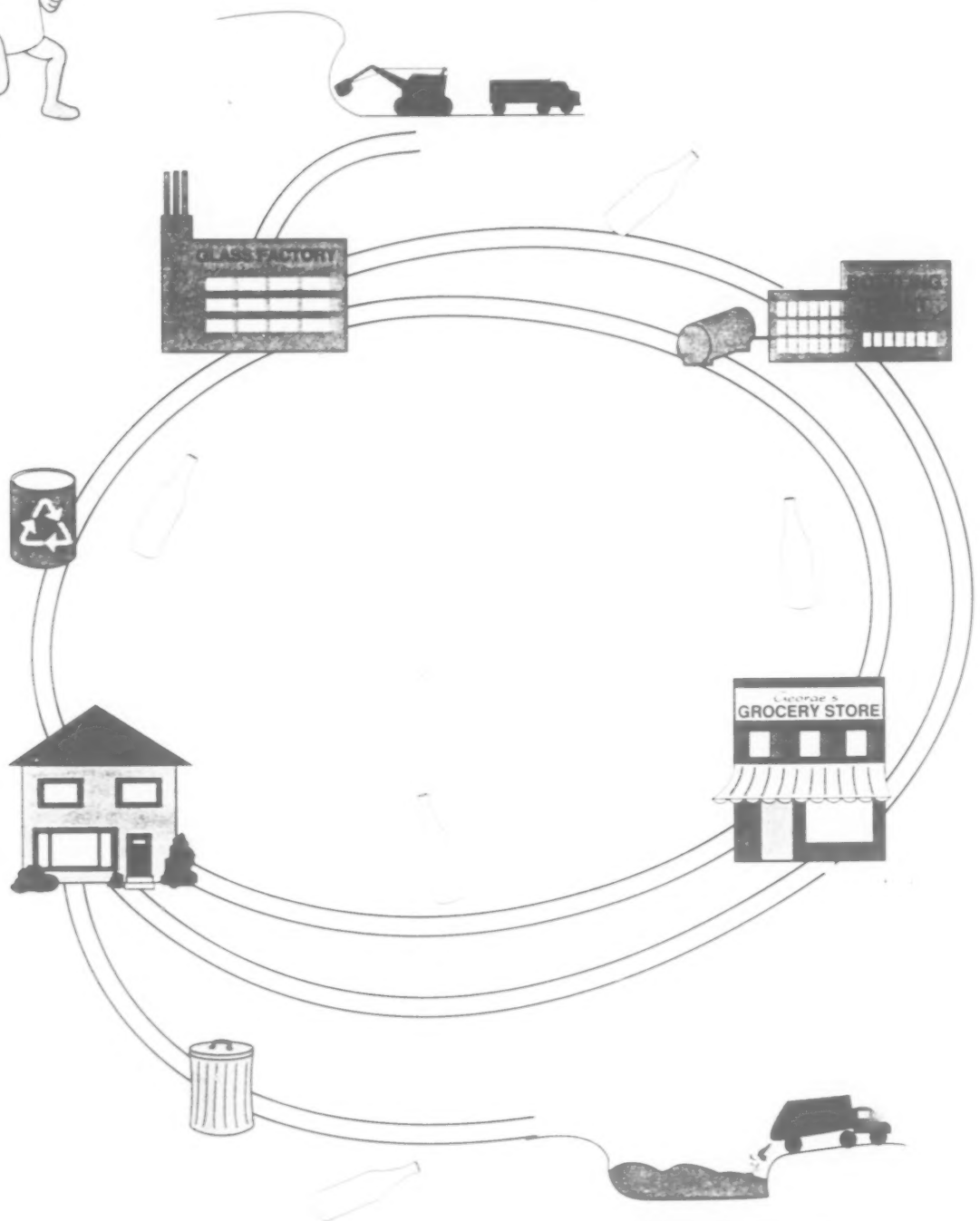
Follow that Bottle!



Use a red crayon to trace the path the bottle takes to get from the glass factory, to the bottling plant, to the grocery store, to your house, and finally to the land fill.

Use a green crayon to trace the path the bottle will take if it is recycled and it comes back to you full of soda.

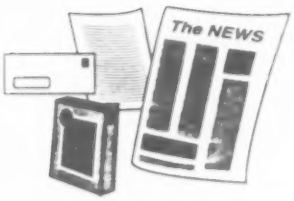
Which is better for the environment: throwing the bottle away or recycling?



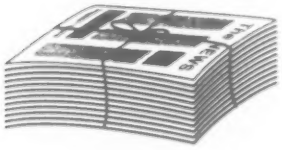
Recycle—It's Easy!

You can help your family recycle by following these simple directions.

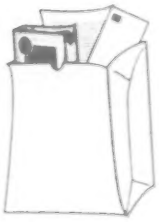
Mixed paper and newspaper



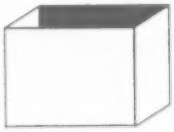
- Bundle and tie newspaper



- Put mixed paper in large grocery bags

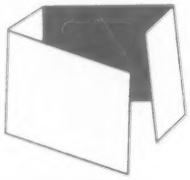


Corrugated cardboard

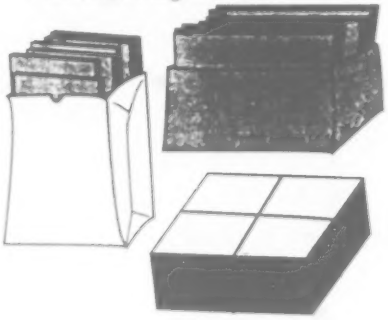


- Look for the ribbed, wavy layer.

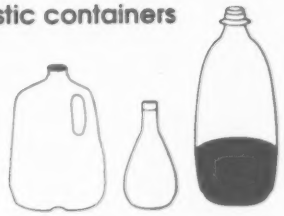
- Flatten the cardboard



- Bundle, bag or box it



Plastic containers



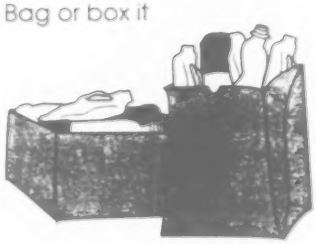
- Separate by recycling code

- Remove caps and rings

- Rinse

- Flatten

- Bag or box it



Check with your local government or recycling center to find out what is recyclable in your community.

Mixed paper

- ❑ yes
- ❑ no

Newspaper

- ❑ yes
- ❑ no

Corrugated cardboard

- ❑ yes
- ❑ no

Plastic containers

1	❑ yes	❑ no
2	❑ yes	❑ no
3	❑ yes	❑ no
4	❑ yes	❑ no
5	❑ yes	❑ no
6	❑ yes	❑ no

Recycle—It's Easy!

Glass bottles and jars

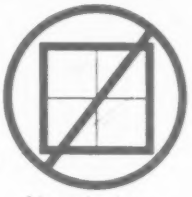
- Rinse

No need to remove labels

- Separate colors

Clear Brown Green

No lightbulbs



No windows

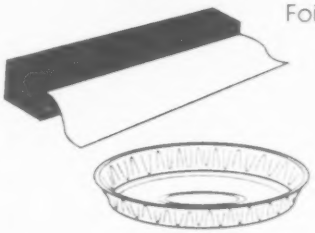
No dishes or glasses

- Put in bags, boxes or buckets

Aluminum

Aluminum cans

Foil



Pie plates

Magnets won t attract aluminum

- Rinse

- Flatten (if required)

- Separate cans from other aluminum

- Bag or box it

Tin cans

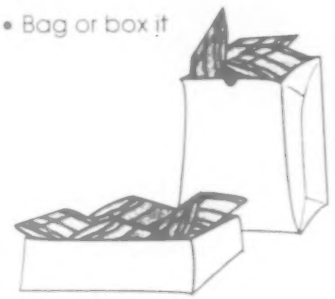
- Rinse

- Remove the label (if required)

- Open both ends

- Flatten

- Bag or box it



Check with your local government or recycling center to find out what is recyclable in your community.

Glass bottles and jars

- ❑ yes
- ❑ no

Aluminum cans

- ❑ yes
- ❑ no

Tin cans

- ❑ yes
- ❑ no

Home Recycling Survey

Here is a recycling survey for you and your parents to do together. Read each question and check your answer. Then turn the page to find out what you can do to help our environment.

	Yes	No
1. If you take more food than you can eat, do you throw the leftovers in the trash?	❑	❑
2. Do you use paper cups and plates for cookouts or picnics?	❑	❑
3. Do you bring lunch to school in a paper or plastic bag and throw the bag away every day?	❑	❑
4. Do you throw away aluminum cans?	❑	❑
5. Do you use just one side of your writing paper?	❑	❑
6. If you make a mistake when writing or drawing, do you throw away your piece of paper and get a new one?	❑	❑
7. Do you throw away clothes you've outgrown?	❑	❑
8. When you see papers on the floor or ground do you leave them there?	❑	❑
9. Do you buy soda in plastic bottles and then throw them away?	❑	❑
10. Do you ask for or take a bag when buying small things like candy or gum?	❑	❑
11. Do you buy juice or chips in single serving packages?	❑	❑
12. Do you use paper towels for drying your hands or cleaning up spills?	❑	❑
13. Do you throw away glass bottles and jars?	❑	❑
14. Do you use a clean sheet of paper to make paper airplanes?	❑	❑
15. Do you throw away broken crayons?	❑	❑

If you have 10 or more **no** answers you are already helping our environment.

Here's how you can help the environment by reducing waste:

1. Take small portions of food and go back for "seconds" if you are still hungry. Put leftover food in reusable storage containers to eat later.
2. Buy or make up your own "picnic basket" that includes reusable cups, plates, and silverware. Look for these items at garage sales.
3. Buy a lunch box and be cool. Get your friends to use lunch boxes too. Pack your food in reusable containers instead of waxed paper, sandwich bags, or aluminum foil. It will stay fresher and will not get "squished"!
4. Collect and recycle aluminum cans. Aluminum is a very valuable metal and is easy to recycle. Recycling one aluminum can saves enough energy to keep a light bulb lit for 12 hours!
5. Use both sides of a piece of paper when writing letters or doing homework. If you only need to use one side, save the paper in a "reuse" box for future use. Make your paper last twice as long.
6. Use a pencil and erase any mistakes. If you need a perfect copy, practice on one of the papers from your "reuse" box and then copy it over.
7. Save your old clothes for a garage sale or give them to a charity. If they are ripped or torn and cannot be repaired, then use them for cleaning rags (cut off and save the buttons first).
8. Litter is everybody's problem and responsibility. Do your part by picking it up and disposing of it properly—perhaps even recycle it.
9. If possible, buy soda in returnable glass bottles and return them! If only plastic soda bottles are available, do not throw them away. In many communities, they are recyclable.
10. After you buy a small item, take it home in your pocket. You do not really need a bag. If your items are too large for your pocket, then bring a reusable shopping bag you've made.
11. Buy in bulk or buy larger packages and put the amount you need for school or snacks in reusable containers. Buying in bulk is usually cheaper than buying individually wrapped servings and requires less packaging.
12. Use a hand towel for drying your hands and a dish cloth or sponge for wiping up spills. They can be cleaned and used again instead of being used once and thrown away.
13. Do not throw away glass bottles and jars. These can be recycled in many communities. Many can also be reused for storing different things.
14. Make your plane with a piece of paper from your reuse box and save the clean sheet of paper for writing.
15. Save broken crayons in a can for future coloring or art projects. Buy a crayon sharpener to make points on rounded edges.